MACHINERY

Design—Construction—Operation

Volume 46 | APRIL, 1940 | Number 8

PRINCIPAL ARTICLES IN THIS NUMBER

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May MACHINERY will feature the first of two articles on *Design of Dies for Inclinable Presses.* Other articles will deal with "Methods of Increasing the Utility of Die-Castings by Inserts," and "Shell Forging by Extrusion." In addition, there will be the usual sections on Mechanical Movements, Design of Tools and Fixtures, Materials of Industry, and Shop Equipment News.

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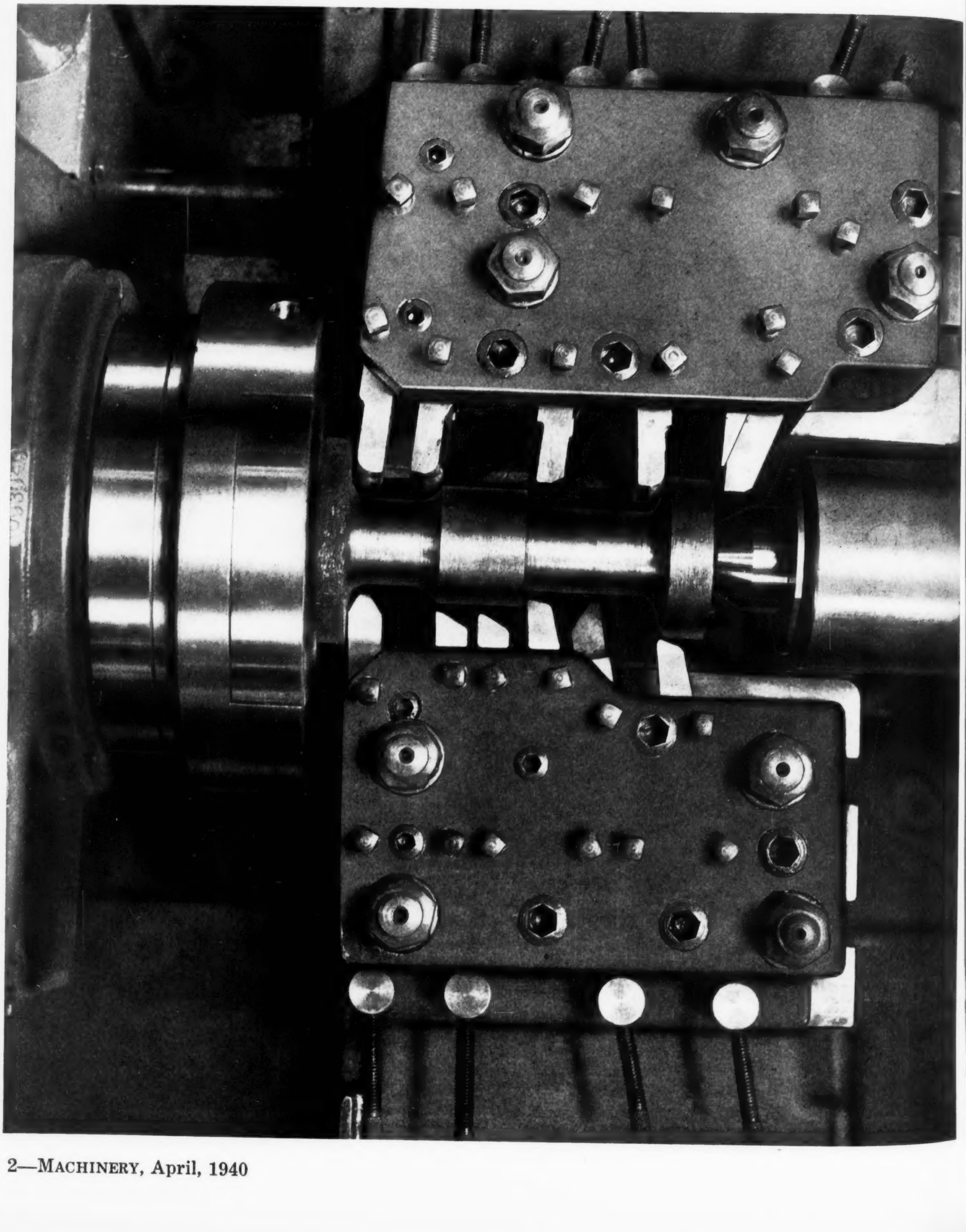
Automotive CLUSTER GEARS



MACHINERY

Volume 46 NEW YORK, APRIL, 1940 Number 8

Tool Engineering the Basis of Automotive Progress

AUTOMOBILES costing $12,000 apiece and as rare as television sets—three-hundred dollar fenders—no two pistons of the same size in the same cylinder block—nine out of every ten automobile workers out of a job—that, according to the chief engineer of one of the prominent automobile companies, would be the picture if the automotive industry were to return to the slow and less precise manufacturing methods prevailing when the industry was born. That a completely different condition exists today is due mainly to the ability of the master mechanics and tool engineers of the automotive industry and the designers of the machine tool industry—because it was through their ingenuity that the high-production methods were developed which brought the automobile within the reach of all, and made possible the huge employment rolls of the automotive and allied industries.

Tool engineering is always looking ahead in automobile plants. Efforts are constantly being made to turn out better cars, and more of them, at the lower costs made possible through the development of increasingly efficient manufacturing methods. The results that such progressive efforts have brought forth during recent months in some of the prominent plants of the automotive industry are presented in this issue of MACHINERY.

Producing Oldsmobile's

THE most outstanding mechanical achievement in the automobiles of 1940 is acknowledged by automotive engineers to be the Hydra-Matic drive available for Oldsmobile cars. With this remarkable drive, there is no clutch pedal to operate and the transmission gears shift automatically through four speed ranges as the car accelerates. In starting the car, it is only necessary to step on a starter button, set a lever on the steering column into either the forward or reverse position, and depress the accelerator pedal. Twelve steps have been eliminated in getting the car into high speed.

Once the car has been started, it can be operated at any speed, stopped at traffic intersections, and started up again without operating anything except the accelerator pedal and the brake. It is impossible to stall the engine, even in starting the car on steep grades.

The Hydra-Matic drive consists of a fully automatic transmission, which is an outgrowth of the semi-automatic transmission introduced on Oldsmobiles during 1937, plus an ingenious liquid coupling embodied within the flywheel. This coupling consists essentially of the two rotating members seen in Fig. 1, which are assembled in the flywheel with their operating faces 1/32 inch apart.

The liquid coupling is located, in reality, between two planetary gear sets, and is not connected directly to the flywheel or the crankshaft. This allows the coupling to run at only seven-tenths the engine speed in starting in first gear, and it can, therefore, be coupled closely for high efficiency. The drive is from the rear half of the coupling, which is on the quill shaft of the first planetary gear set, to the forward half of the coupling, which is on the main shaft leading to the rear planetary gear set. In third and fourth gears, only 40 per cent of the torque is exerted on the coupling, and this results in less slippage and greater efficiency in these two ratios, which are in use most of the time. The housing in which these coupling members are contained is filled with a light oil.

When the engine is started and the coupling member attached to the quill shaft starts revolving, oil is thrown from its forty-eight vanes by centrifugal force against the vanes of the second coupling member. With the engine idling, this force is not sufficient to turn the driven coupling member, but as the motor speed increases, the centrifugal force becomes sufficient to drive the second member and the transmission, so that the car starts moving with a smoothness that is seldom obtained through the conventional clutch. The action of the liquid coupling members is analogous to that of two electric fans faced toward each other when power is applied to only one of the fans. When the accelerator pedal is released in bringing the car to a stop

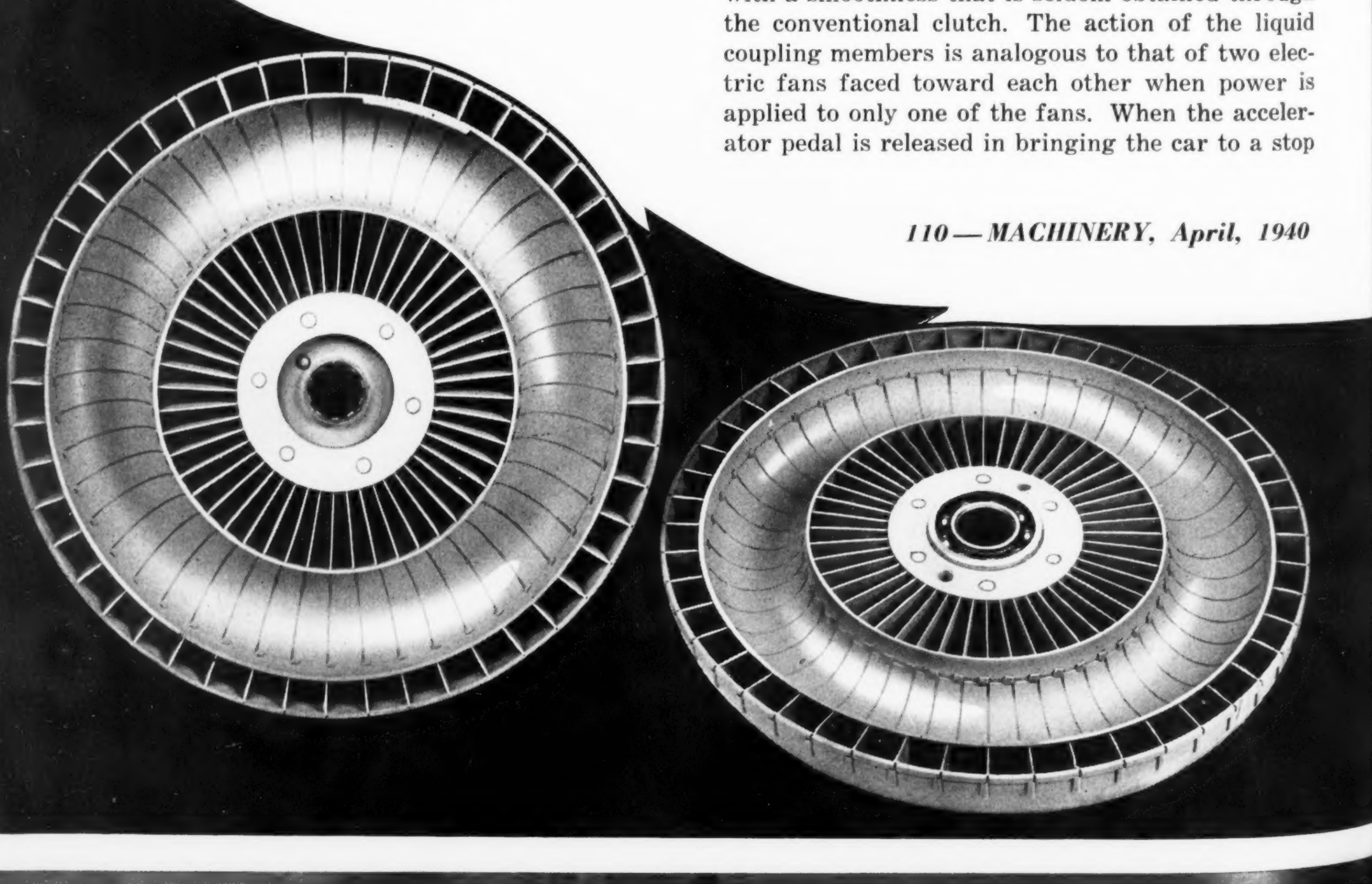
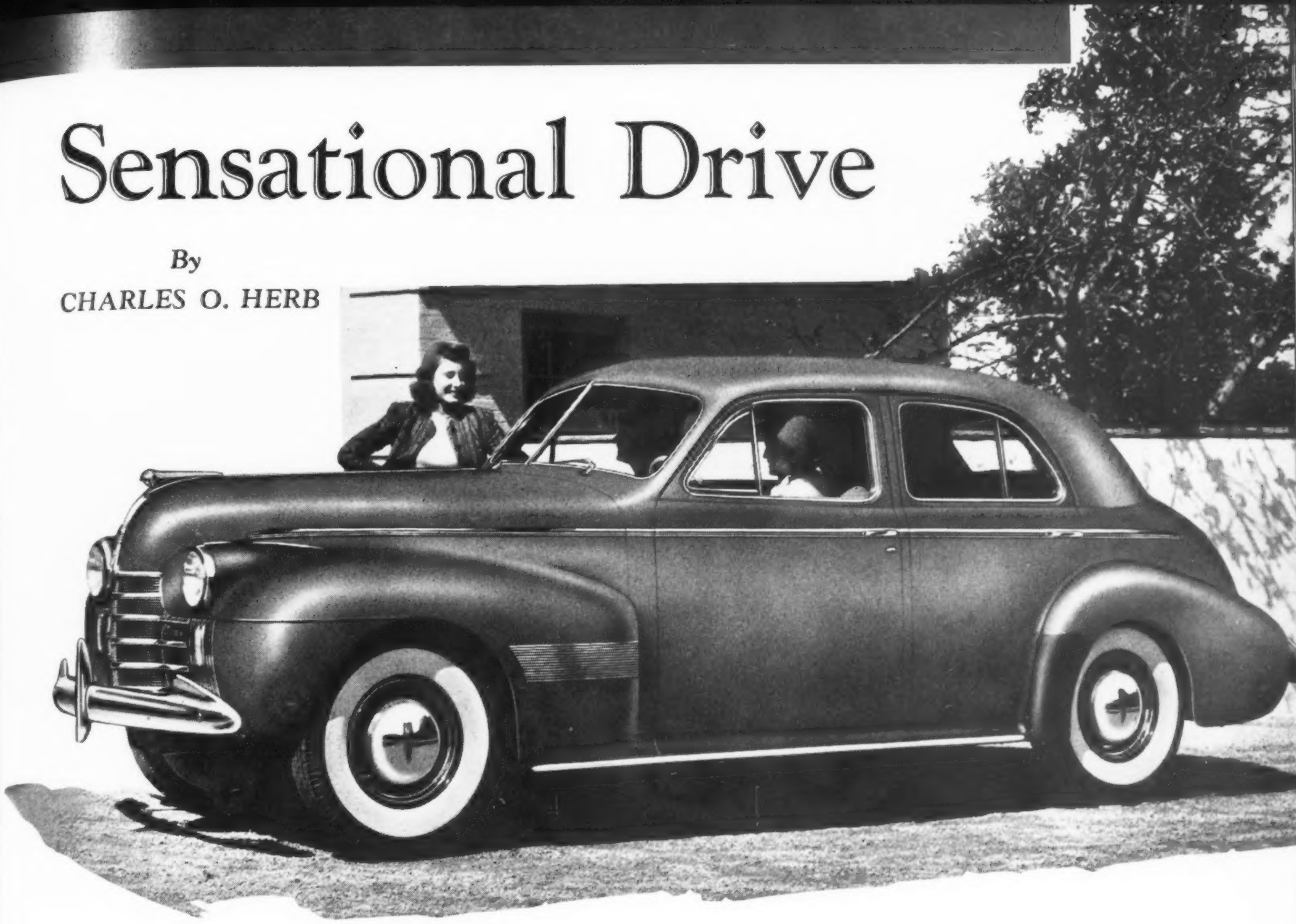


Fig. 1. Driving and Driven Members of the Hydra-Matic Liquid Coupling

Sensational Drive

By
CHARLES O. HERB



or in descending steep grades, the liquid coupling acts as a brake, the oil then being thrown from the transmission coupling member to the quill-shaft coupling member.

Hydra-Matic transmissions are being manufactured in the new $3,000,000 plant of the Detroit Transmissions Division of the General Motors Corporation. Some of the unusual operations that had to be developed for the manufacture of such a strikingly new product will be described in this article. This plant has been tooled up for producing thirty Hydra-Matic transmissions per hour.

Each "torus," as the coupling members are termed, consists of an outer basin-like shell, an inner circular ring having a cross-section similar to one-half of a tube, and forty-eight sheet-metal blades which are made to fit closely the space between the outer shell and the ring, and also a hub in the center of the shell.

Both the torus shell and the ring are formed in power presses from sheet steel 0.095 inch thick. The torus shell is made from a blank 14 3/4 inches in diameter, which is drawn in one operation to a depth of approximately 4 1/2 inches and to an outside diameter of 10 1/2 inches. The next operation, which is illustrated in Fig. 2, consists of forming a hub on the inside. In a subsequent operation, a narrow flange is formed around the periphery of the shell, after which the part goes through a re-

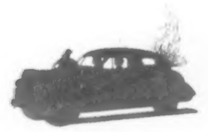


Fig. 2. One of the Press Operations Involved in Producing the Torus Shell of the Liquid Coupling Used in the Hydra-Matic Drives of Oldsmobile Cars

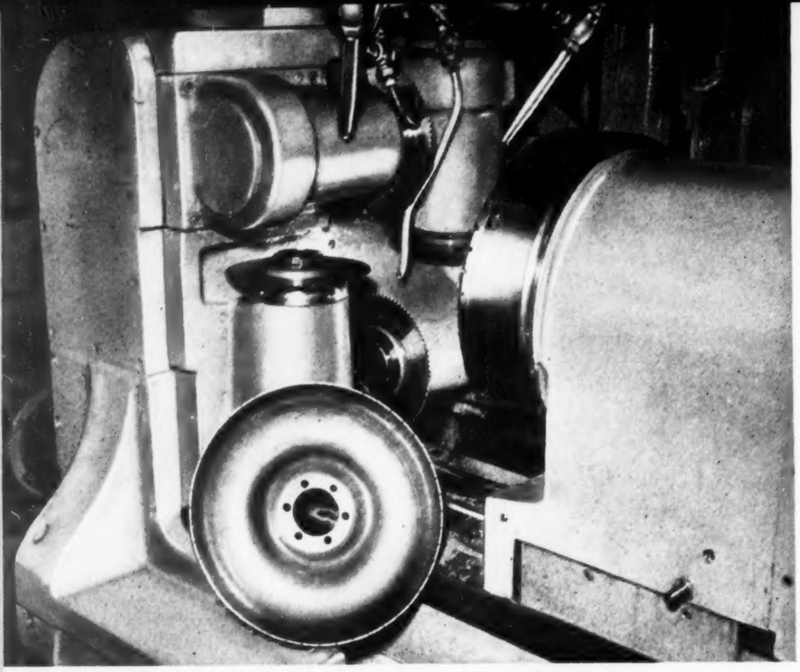


Fig. 3. (Above) Cutting Forty-eight Vane Slits, Four at a Time, in Torus Shell. Fig. 4. (Below) Two Vane Slits are Cut at a Time in Two Torus Rings

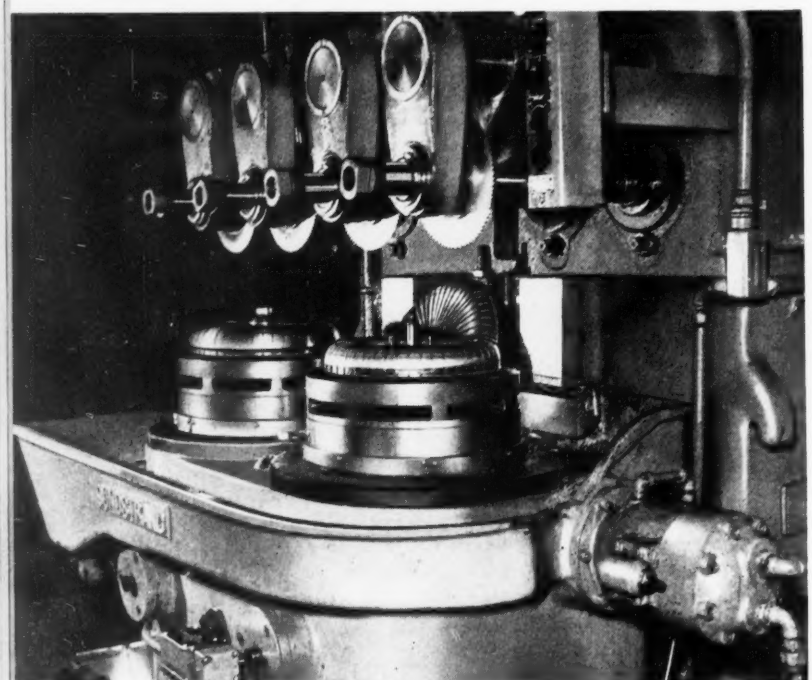


Fig. 5. (Below) Bench where Torus Shells, Rings and Vanes are Assembled Ready for an Operation which Locks Them Together

striking operation. The final press operation consists of piercing a 2 1/8-inch diameter hole in the center of the hub and six holes of 3/8 inch diameter around the top of the hub.

The next step in the manufacture of the torus shell consists of sawing forty-eight short slits around the peripheral edge to receive one end of the vanes. These slits are cut four at a time in the machine illustrated in Fig. 3, which is equipped with four circular saws, two of which are mounted on vertical spindles and two on horizontal spindles. The saws are 0.030 inch in thickness.

The torus shell is seated solidly in a vertical position on a fixture mounted on the work-head at the right, and is held securely by a cover plate that is clamped on top of the shell. Slots are provided in the cover plate for the saws. The work-head is operated hydraulically to and from the saws, and with each return movement its fixture is indexed an amount equal to the distance between two slots; thus, each shell is completed with twelve indexings.

Slitting of the torus rings is accomplished in a somewhat different manner, due to the fact that the slits extend around almost the complete cross-section of the rings. This operation, which is shown in Fig. 4, is performed on a milling machine equipped with four saws mounted on horizontal arbors. The table of this machine is fitted with two fixtures for slotting two torus rings at a time, the table being moved vertically to and from the cutters. The fixtures are indexed automatically with each downward movement of the table, twenty-four indexings being necessary to complete the slitting of two rings.

Assembly of the torus units is accomplished by hand, as shown in Fig. 5, the sheet-metal vanes first being slipped into the slits of the torus ring, after which the torus shell is placed over the vanes and tightly assembled by applying a wooden mallet. The entire unit is then transferred to a fixture fitted with ironing dies that bend the vane projections tightly against the outside of the torus shell and against two sides of the torus ring.

A multiple-spindle machine employed for drilling and countersinking forty holes around the flange of the flywheel and six holes around its hub is shown in Fig. 6. Half these holes are drilled in one piece by means of the head at the left, and a similar number are countersunk by the right-hand head in a flywheel that was previously drilled by the left-hand head. Then the work-fixtures are indexed for drilling and countersinking the remaining holes. Both fixtures are provided with a device actuated by a lever extending toward the front of the fixture for lifting the work at the end of the operation. Pilot-pins on the drill head enter bushings in the fixture base to insure accurate location of all holes.

Extreme accuracy is required in facing the flange of the flywheel and its mating surface on the flywheel cover, as the metal-to-metal contact between these surfaces must be close enough to prevent any leakage of oil at a pressure of 400 pounds per square inch. The machining of the flange on the flywheel cover is illustrated in Fig. 7. It is performed in one operation only on an automatic lathe equipped with tools at the front of the carriage which turn the outside diameter and form almost imperceptible recesses in the flange face. A tool at the rear of the carriage takes a bevel cut on the flange face, and another tool at the rear moves forward to chamfer the back edge of the flange. Stellite tools are used in this operation.

The ring gears are produced from steel which is received at the plant in the form of long bars. These bars are coiled between rolls and then cut off in lengths sufficient to form complete circles of the required diameter. The ends are butt-welded together to form continuous rings, after which the rough gear blanks are normalized and then flattened and sized in a die. After being turned, faced, and bored in a lathe, these rings are conveyed to gear-hobbing machines for the operation illustrated in Fig. 8. Twelve blank rings are handled simultaneously on these machines, one hundred and forty-eight teeth of 10 pitch being hobbed in one operation.

All the rotating parts used in the liquid coupling are inspected individually for static balance, and corrected for any unbalance. The finally assembled unit is similarly checked; the amount of static unbalance in the complete unit must be less than 1/4 ounce-inch. Balancing of the flywheel cover is shown being performed in Fig. 9. The machine is so designed that a beam of light passes from top to bottom of the glass chart at the left of the machine as the work is revolved.

If the beam of light remains between two vertical lines near the left-hand side of the chart, the flywheel cover is in balance. If it strikes a point between any of the other vertical lines, the part is out of balance. The operator immediately knows the amount of unbalance, because each vertical line from left to right of the first space indicates 1/4 ounce-inch. Degree graduations on the chart along the horizontal lines correspond with similar graduations around the fixture and indicate the point at which a correction must be made on the flywheel flange to correct the unbalance. Metal is removed by means of the spot-facing tool held in the spindle of the balancing machine.

Watch-like precision is necessary on a considerable number of parts that control the operation of the automatic transmission. This is particularly true with respect to two aluminum die-castings of

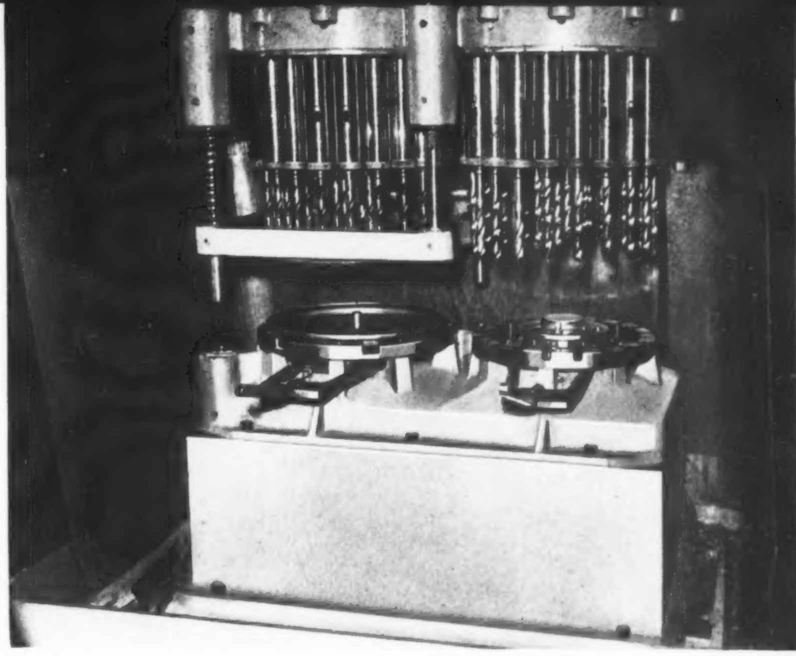


Fig. 6. Forty-six Holes are Drilled and Countersunk around the Flange and Hub of Flywheel Covers in Four Operations on This Two-head Machine

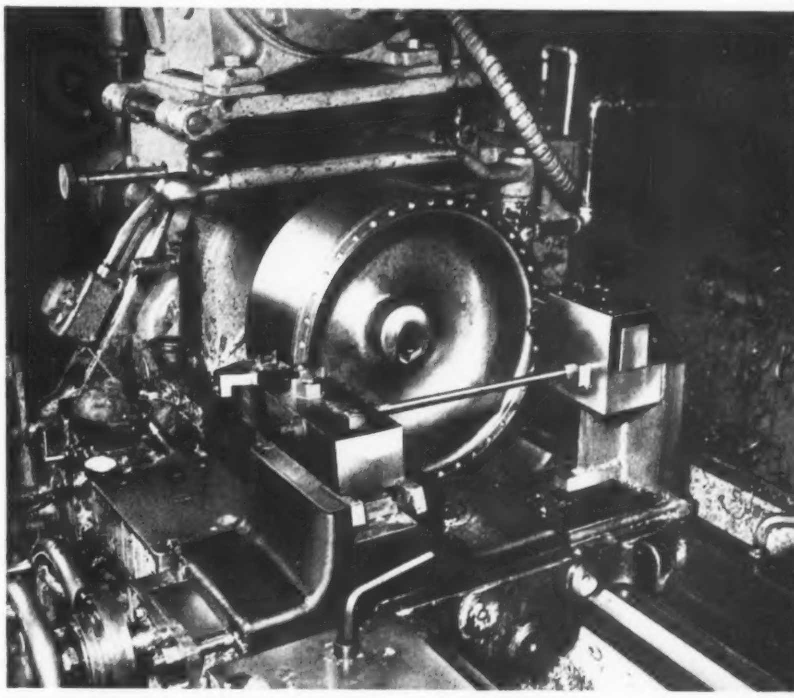


Fig. 7. (Above) Turning Minute Recesses in the Flywheel Cover in an Automatic Lathe. Fig. 8. (Below) Hobbing Twelve Ring Gears in One Operation

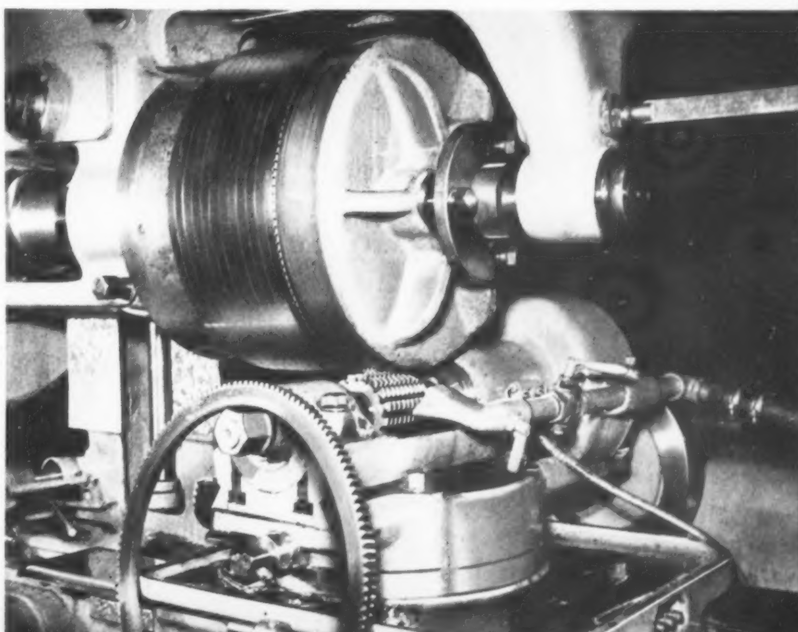


Fig. 9. (Above) Balancing Flywheel Cover within 1/4 Ounce-inch. Fig. 10. (Below) Drilling and Tapping a Large Number of Holes in Valve Bodies

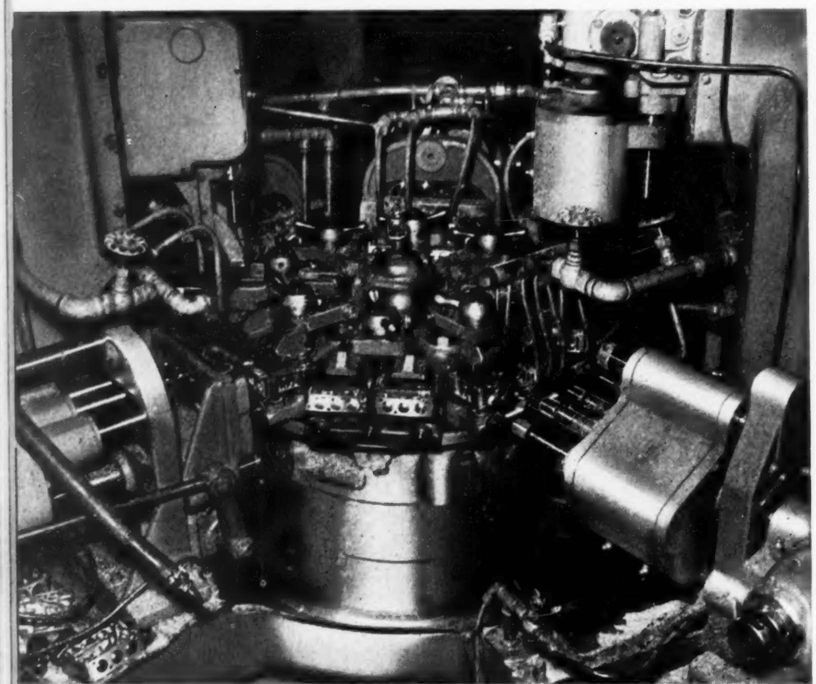
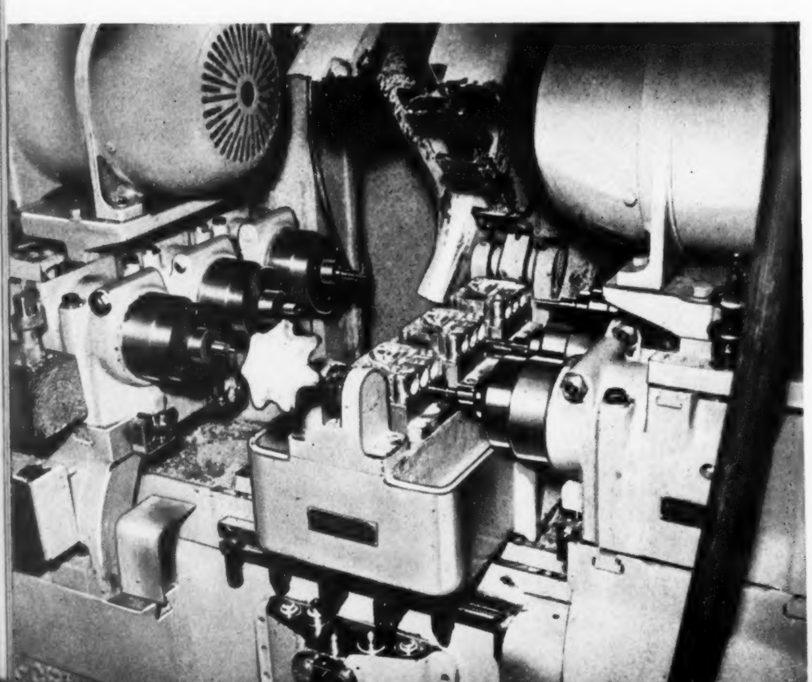


Fig. 11. (Below) Precision Boring Machine with Three Fixture Stations, for Finishing Thirty Bores in Each Shifter-valve Body



rather intricate design which make up the shifter-valve body. One of the operations on these parts consists of drilling and tapping a large number of holes on a completely automatic machine equipped with six horizontal tool-heads and two vertical heads, as shown in Fig. 10. The eight-station fixture of this machine is designed to receive two parts in each station for simultaneously drilling or tapping by tools of the same or different heads as the parts move to the various stations. Close accuracy is imperative on the center-to-center distances between the various holes.

Precision-boring of the piston chambers in these valve bodies is performed as shown in Fig. 11 in a machine equipped with six tool-spindles, three on each side of the work-carriage. Tungsten-carbide tools are used. Three valve bodies are placed in the fixture at a time, and these bodies are progressively loaded from front to back in the three stations for boring all six chambers in each body. After the fixture is loaded, the table moves toward the tool-spindles at the left, which are each fitted with two cutters for machining a piston chamber and a hole of smaller diameter. Then the table moves toward the right for boring the opposite chamber and two additional holes of small diameter. Thus, thirty surfaces are bored in each part. The chamber diameters must be held to the specified size within a total tolerance of 0.0007 inch.

An ingenious inspection method is employed for checking the various bores in these valve bodies, as well as the bores in many other parts that are assembled into the automatic transmission. Inspection is accomplished by means of gages having small holes drilled from the gaging surfaces to a center hole which is connected to an air line. A predetermined air pressure is maintained in the line, and the air is allowed to escape freely through the gage orifices unless a piece of work is placed on the gage. When this is done, the escape of air is retarded by the work, and the amount of air that can pass between the gage and the surface being inspected depends upon the diameter of that surface. By observing a dial gage that indicates the pressure on the air escaping through the gage orifice, the inspector immediately knows whether the hole is within the required dimensional tolerance.

This method of inspecting a valve body is seen in Fig. 12. The upper gage at the station being used indicates the constant pressure on the air line, while the lower gage shows the pressure on the air that escapes between the work and the gage when a valve body is slipped along the various registering points of the gage. With a line pressure of 30 pounds per square inch, seventeen graduations on the lower gage will represent only 0.001 inch on work diameters, so that minute dimensional errors

can be easily detected. Masters, such as seen in front of the various gaging stands, are used in regulating the pressure of the air delivered to the gages, so that "Go" and "No Go" limits can be readily established, as, for instance, above graduation 9 on a gage and below graduation 26. The particular gage being used in Fig. 12 has seven gaging surfaces which are used successively by slipping the valve body the entire length of the gage to detect the accuracy of seven different bores on one center line. Several of these air-line inspection stands with a multiple number of stations provide for the application of this gaging principle to a wide variety of work-pieces.

One of the most interesting operations in the plant from the standpoint of machine design consists of drilling and tapping seventy-two holes in the transmission case. This operation is performed in a completely automatic machine unit, of which the starting end is shown in Fig. 13. The transmission cases are loaded into a V-trough and transferred to various working positions through the action of a sliding rod equipped with flat dogs. This rod swivels to bring a dog horizontally in back of each transmission case in the trough, then slides forward to move each case to its next working position, swivels upward to raise the dog from contact with the transmission cases, and slides back to the starting position, ready to pick up the next set of cases.

Single- and multiple-spindle drilling and tapping units arranged in an angular position at the front and back of the troughs drill and tap various holes in the transmission cases as they are indexed to the different stations. When they reach the far end of the machine, two multiple-spindle drilling heads arranged in a horizontal plane drill and tap one end of the cases. These heads are mounted on an indexing slide so that the drills can be used first and then the taps. Clamps are provided at the various stations of the machine for securely and accurately gripping the transmission cases to suit the operation being performed.

The flywheel cover castings are drilled, tapped, and bored in the rotary type of machine illustrated in Fig. 14, which is equipped with two horizontal heads, operated hydraulically to and from the indexing work-fixture. The holes are drilled by the head seen at the lower left in the illustration, which is also equipped with a boring spindle for machining the large-diameter hole in the center of the flywheel cover. The second multiple-spindle unit on the tool-head taps all of the holes drilled by the first head. Eight work-stations are provided on the indexing fixture, each flywheel cover being mounted twice on the fixture with the opposite sides toward the tool-spindles.

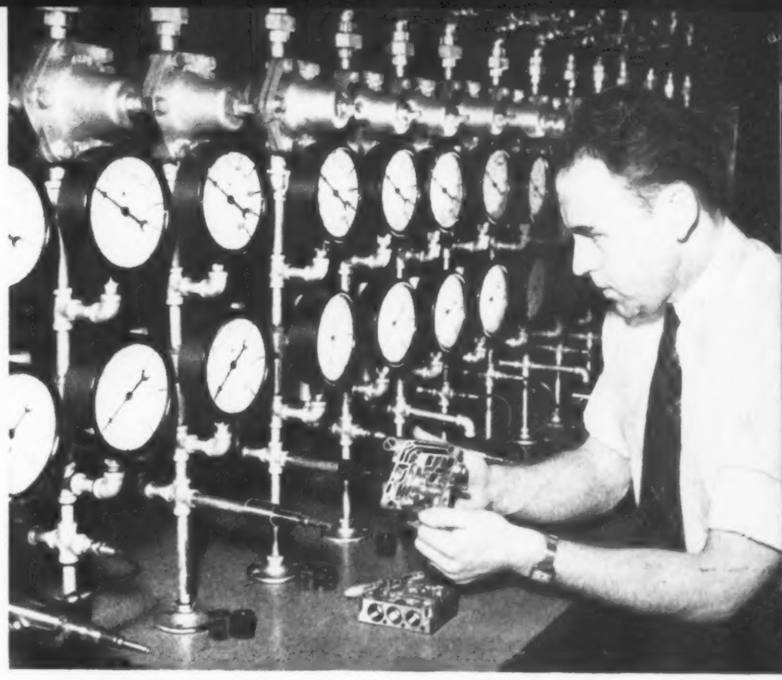
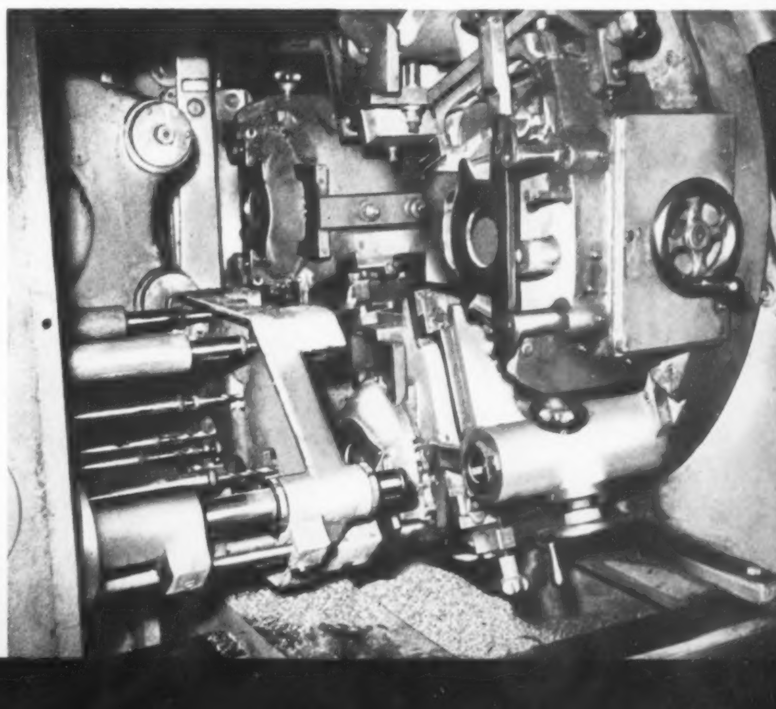


Fig. 12. Air under Pressure is Used for Checking the Accuracy of the Bores in Many Parts of the Automatic Transmission

Fig. 13. (Above) Drilling, Tapping, and Reaming Transmission Cases. Fig. 14. (Below) Drilling, Tapping, and Boring Flywheel Cover Castings



Operations in Studebaker's

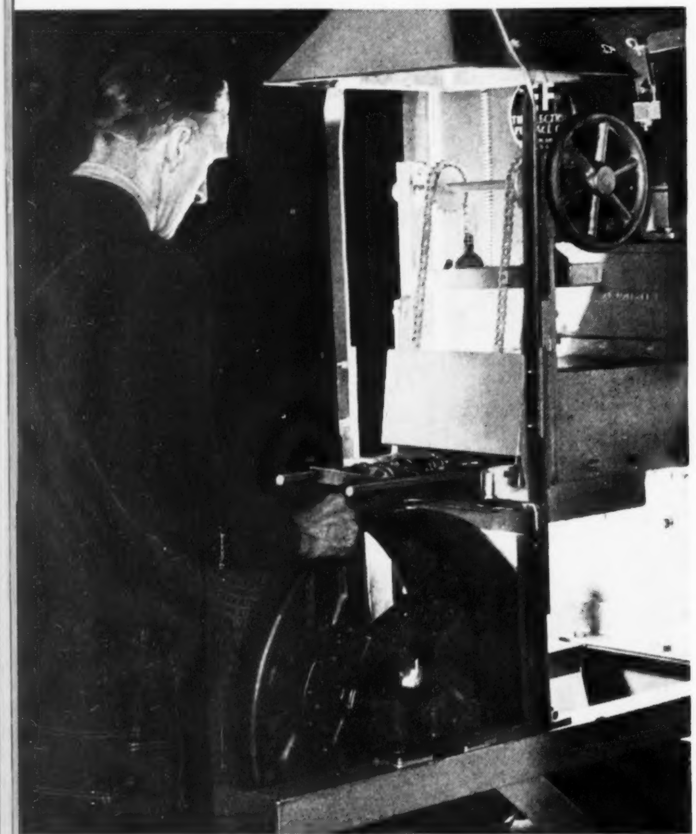
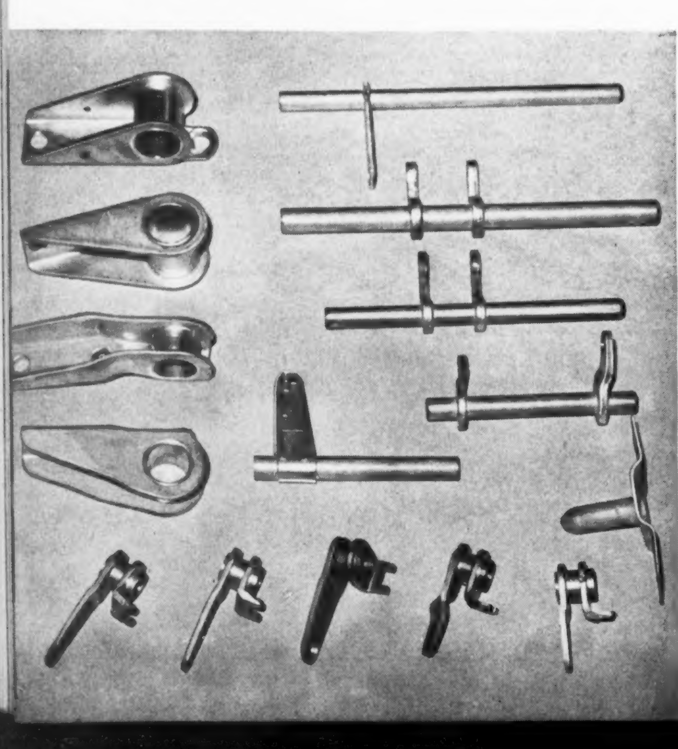


Fig. 1. Tubes, Levers, and Brackets are Copper-brazed Together as They are Carried through Reducing-atmosphere Furnaces of the Electric Heating Type

Fig. 2. Typical Examples of the Parts Copper-brazed in the Reducing-atmosphere Furnaces, Consisting of Tubes with Levers and Brackets Pressed on Them



ALMOST one and a half millions of dollars were expended for new manufacturing equipment by the Studebaker Corporation, South Bend, Ind., prior to the introduction of the Champion line of automobiles. The wisdom of this investment is strikingly apparent from the fact that the concern has since risen rapidly to eighth position in the automobile industry from the standpoint of number of cars manufactured. Some operations performed in the Studebaker plant that differ from conventional practice will be described in this article.

One of two reducing-atmosphere furnaces installed by the Electric Furnace Co. for copper-brazing a large variety of parts is illustrated in Fig. 1. The parts to be brazed are first pressed on each other to a tight fit, and then a ring of pure copper wire is placed beside the joints to be brazed. The parts are next laid on the chain link conveyor belt of the furnace, as seen in the illustration. Maximum production of the furnaces is obtained by nesting small parts within the larger ones. Each furnace handles 7 1/4 pounds of work per square foot of conveyor belt every eight hours. One of the furnaces has a belt 12 inches wide, and the other a belt 8 inches wide. The over-all length of the furnaces is about 38 feet.

In passing through the furnaces, the work first enters a heating zone approximately 8 feet in length, which is electrically heated to a temperature of 2040 degrees F. It then passes through a cooling section 30 feet in length, 55 minutes being required to traverse the entire length of the furnace. The desired atmosphere is obtained in both the heating and cooling zones by the use of one part of city gas in combination with six parts of air. The water vapor content is removed before the resulting slightly reducing atmosphere is carried into the furnace. Running water flows between the outer and inner chambers of the cooling zone to keep the temperature low.

About thirty different assemblies are brazed together, typical examples being shown in Fig. 2. These include steering-knuckle support-arm brackets, clutch-release shafts, clutch-operating shafts, and transmission remote control levers. Generally speaking, an assembly consists of one or more bent levers or brackets attached to a piece of tubing which serves as a bearing for a shaft or as a shaft. These parts are thoroughly washed before they reach the brazing furnaces. The copper-brazing wires are placed on the tubes beside the levers or brackets that are to be attached to them.

Modernized Plant

In the passage of the work-pieces through the heating zone of the furnaces, the copper wire melts and flows between the tubes and the other pieces and forms joints that have proved to be stronger than the parent metal itself. This strength is derived from the alloying of the copper with the steel of the parts being brazed together. Whether a joint is of the required strength or not can be determined by merely observing if the copper has flowed all around the tube through to the opposite side of the pieces being brazed. This permits an unusually positive method of inspection. Parts brazed together by this practice can be cyanide-hardened after the brazing operation, because the hardening is performed at about 1550 degrees F. which is below the melting point of copper.

In revising the manufacturing practices of this plant, special attention was given to improving the methods of tinning and babbitting the crankpin bearing of connecting-rods. As a result, the crankpin bearings now being babbitted have a much longer life than before. Upon the completion of all machining operations, prior to tinning and babbitting, the connecting-rods are loaded on a conveyor which carries them through a washing machine. Here they are dipped into two tanks, the first of which removes most of the oil and grease, while the second cleans the connecting-rods electrolytically and slightly etches the crankpin bearing. Blasts of air then blow the water off the connecting-rods, after which they are completely dried by being passed through a gas-heated oven.

When the connecting-rods leave this oven, as seen at the left in Fig. 4, they are taken by an operator and held in the small bench type machine shown while he operates a lever to draw a sponge that has been dipped in flux through the crankpin bearing. The sponge is swiveled in this process, so as to insure the application of the acid over the entire crankpin bearing surface. The flux consists of water-white zinc chloride of 50 degrees Baume, to which 5 per cent hydrochloric acid is added. Chemically pure acid is used, and the flux crock is never refilled, a complete new supply of flux being provided as the crock becomes empty to insure that the flux will always have a minimum iron content. The flux removes any rust from the etched crankpin bearings, and causes the tin to adhere to the steel bearing surfaces.

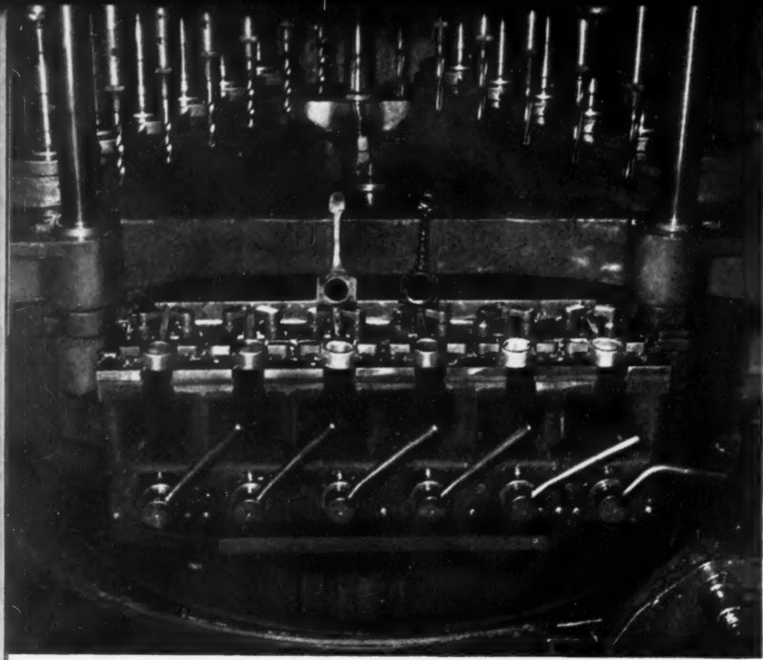


Fig. 3. Machine for Core-drilling the Oblong Crankpin Bearing in the Rough Connecting-rod Forgings, as well as for Drilling and Reaming the Wrist-pin End

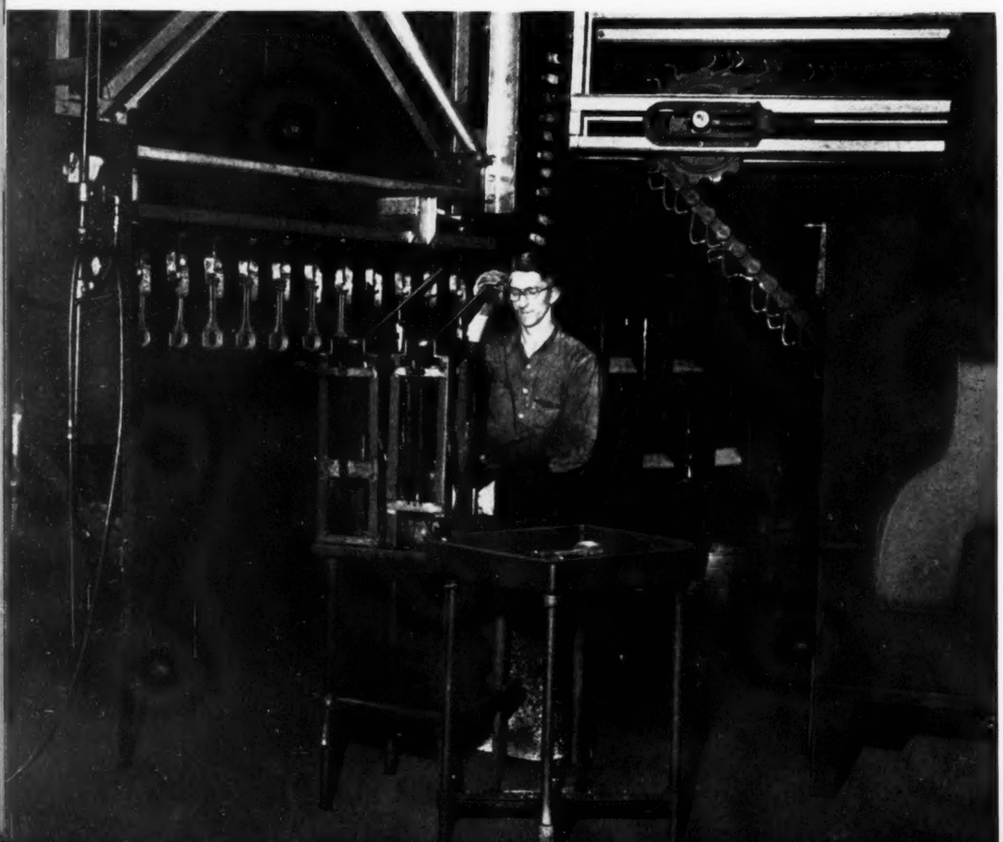
From the flux-swabbing operation, the connecting-rods are hung on a conveyor which leads to the tinning unit seen at the right in Fig. 4. Here they are automatically dipped into the tinning bath, which is maintained at a temperature of 550 degrees F. maximum, and remain in this bath a predetermined length of time as controlled by the speed of the conveyor. It has been found that the best tinning job is obtained by holding the rod in the bath the shortest possible time. This enables the connecting-rods to be babbitted with the tin in a molten state and the main bulk of the rod, at the same time, held at as low a temperature as possible —a factor of considerable advantage in the rapid solidification of the babbitt.

Pure tin is used in the tinning operation, and the contents of the melting pot are analyzed once a week to make certain that the impurities are kept to a minimum. Each connecting-rod is bumped against the tin-melting pot while it is being removed from the conveyor, in order to throw off excess tin.

As soon as the connecting-rods are removed from the tinning conveyor, they are placed in fixtures of the rotary babbitting machine shown in Fig. 6, which are stationary in the loading station but are spun at 800 R.P.M. in the pouring station and during the cooling, which takes place as each fixture passes around the machine and back to the loading station. It is important that the surface of the tin be in the molten condition at the time that the babbitt is poured, so as to insure a good bond between the tin and the babbitt. To provide for this, the operation is so timed that not more than thirty seconds elapses between the tinning and the pouring of the babbitt.

The connecting-rods are located vertically in the fixtures of the babbitting machine, and are clamped by a front plate, operated through a lever on top of each fixture. This front plate has an opening through which the babbitt is poured into the revolving connecting-rod. After loading a rod into the fixture, the man in the loading station pushes an electric button to start the motor that drives the fixture. The man seen in the background of Fig. 6 pours a measured amount of babbitt into the crankpin bearing of each connecting-rod from a small ladle which he dips into the babbitt pot.

Fig. 4. General View, Showing One End of Connecting-rod Washing Machine, Flux-swabbing Machine, and Tinning Unit



Connecting-rods of two different sizes are babbitted in this machine at the rate of 360 rods an hour. There are fourteen fixtures provided on the machine. The babbitt is maintained at a temperature of 830 degrees F. in a pot located adjacent to the tin pot.

In Fig. 3 is shown a special Greenlee machine which drills and reams the rough connecting-rod forgings long before the tinning and babbitting operations are reached. Six connecting-rods are loaded into each of the three indexing fixtures. Each rod is gripped by four jaws that are operated vertically through one lever.

In the first working station at the left of the machine, the crankpin bearing of each connecting-rod is core-drilled on one side only, and the wrist-pin hole is drilled. The crankpin bearing cannot be core-drilled completely around, owing to the fact that it is forged oblong, in order to obtain a round hole after the cap has been cut from the connecting-rod and assembled with the rod.

In the second indexed position of the work-fixture, the opposite side of the crankpin bearing is core-drilled in each rod and the wrist-pin hole is reamed. The core-drills are of the adjustable inserted-blade type.

Steering-knuckle support arms for the Champion cars are machined in the knuckle-pin bearings and on the two bracket spindles at the opposite ends of the arms in the special Baker machine illustrated in Fig. 5. The work-drum of this machine is double-indexed, and two complete sets of identical tools are provided, so that two parts are finished with each indexing.

In the first indexed position of the work-drum, which is at the lower front of the machine, four spindles on both the left- and right-hand heads advance tools for drilling the knuckle-pin holes and spot-facing the shoulders of the bracket spindles. In the next indexed position, tools on both heads counterbore the knuckle-pin holes and finish spot-face the spindle shoulders.

In the third indexed position, box type tools on the tool-heads turn the spindles while the king-pin holes are being rough-reamed. Finally, in the fourth position, the king-pin holes are line-reamed by tools on the left-hand head, as seen at the top of the machine, while a small-diameter hole is drilled length-

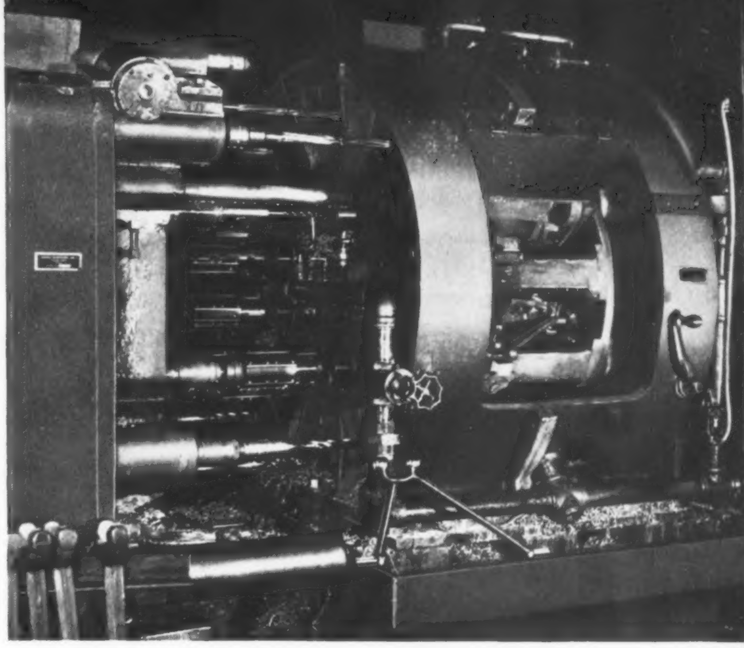
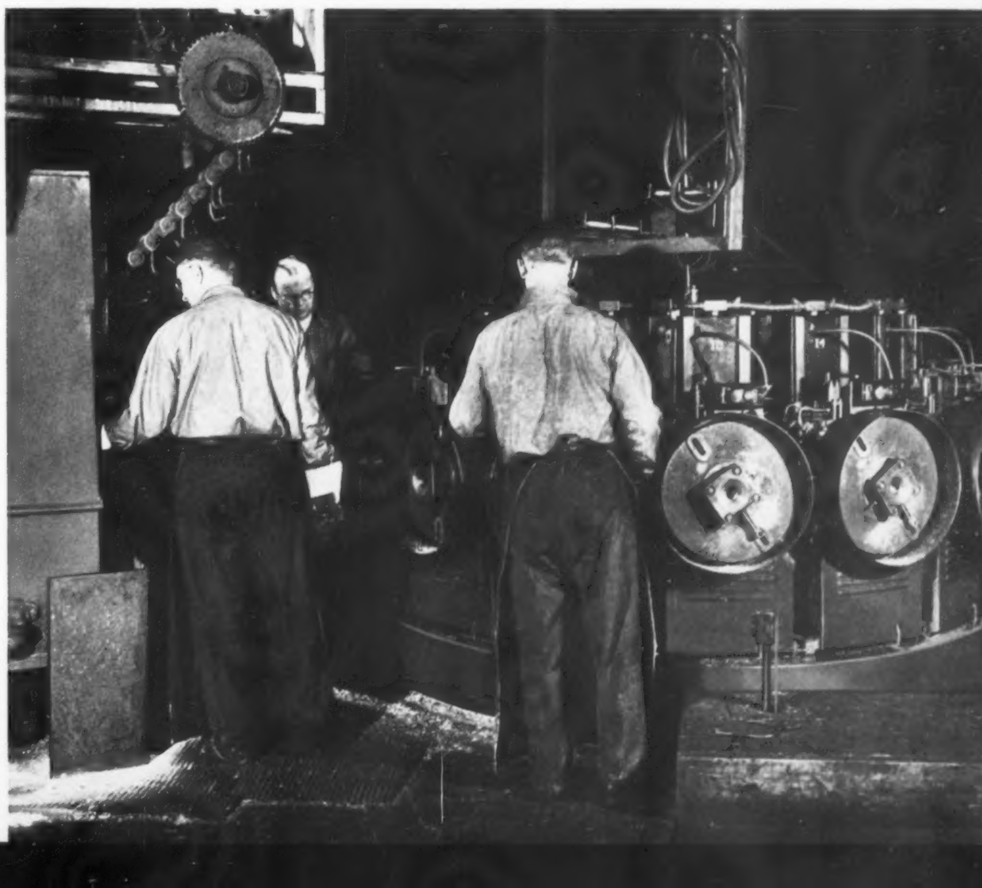
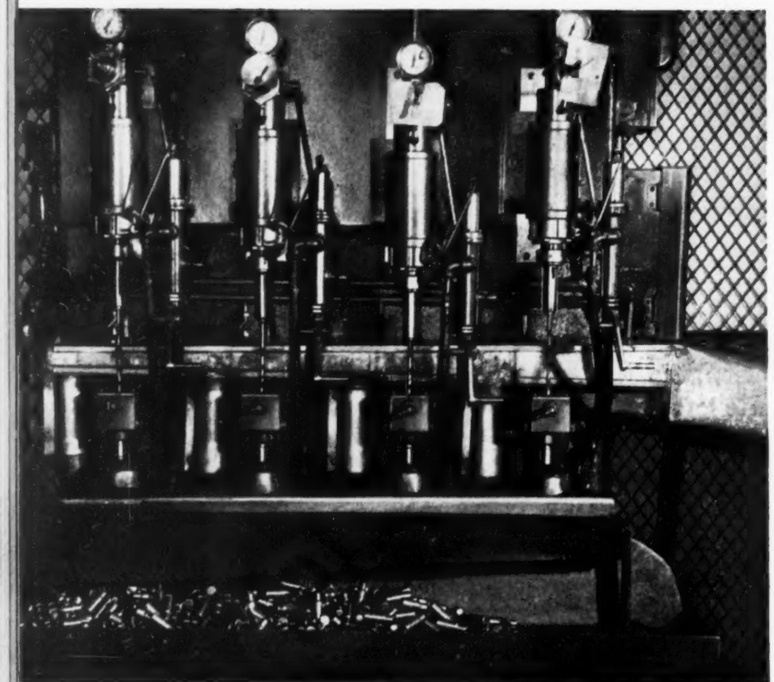
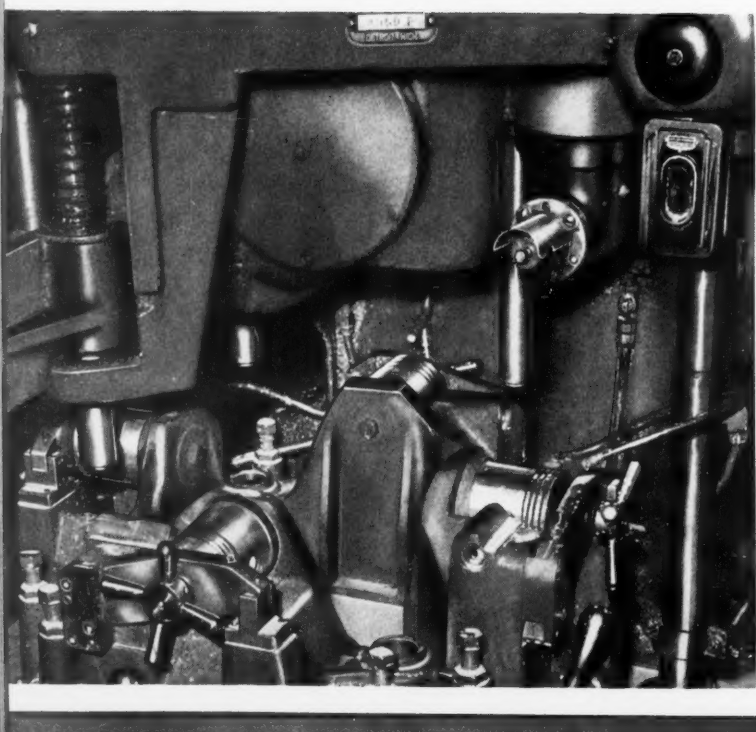


Fig. 5. The Knuckle-pin Holes and the Bracket Spindles of Steering-knuckle Arm Supports are Completely Machined in One Pass around This Special Machine

Fig. 6. Rotary Machine for Babbitting the Crankpin Bearings of Connecting-rods; the Output is 360 Rods an Hour







wise into the bracket spindles by both the right- and left-hand heads.

When these steering-knuckle support arms leave the machine, the knuckle-pin holes must be between 0.865 and 0.866 inch in diameter, and the spindles within 0.745 and 0.755 inch in diameter. Fifty pieces are handled per hour by this machine. The tool-heads and the work-drum are hydraulically actuated.

Two Woodruff keyways are milled at one time in line with each other on one end of crankshafts by the two-spindle Cincinnati milling machine shown in Fig. 7. The two cutter-heads are lowered toward the work at a fast rate, the milling cut being taken at a slower feed. The crankshaft is supported by V-blocks at each end, and is located by the operator's moving a handle on the left-hand side of the machine, which slides an angular block against one side of a crankpin to locate the opposite side against a flat block.

Fast drilling of the cast-iron valve-stem guides is accomplished with the four-spindle machine illustrated in Fig. 8. These guides are 2 inches long and are drilled the full length to a diameter of 19/64 inch. For this operation, each guide is held between the conical seats of two chucks, the bottom chuck being raised and lowered by means of an air cylinder for reloading purposes. When the bottom chuck is raised, air is admitted into the cylinder of the drill-spindle unit to start feeding of the drill. Air for operating both the bottom chuck and the drill spindle is controlled through one lever, which is seen at the right of each spindle. One man is kept busy loading the four stations of this machine, and he drills, on the average, 5000 pieces per eight-hour day. The air pressure applied to feed each spindle is regulated according to a gage at the top of the spindle air cylinder.

Drilling and slotting of the aluminum-alloy pistons are performed by the Krueger four-station indexing type of machine shown in Fig. 9. The pis-

Fig. 7. (Top) Two-spindle Hydraulically Actuated Machine Employed for Simultaneously Milling Two Woodruff Keyways in One End of Crankshafts

Fig. 8. (Center) Four-spindle Machine Employed for Drilling 5000 Valve-stem Guides per Eight-hour Day

Fig. 9. (Bottom) Machine Designed for Drilling Two Holes and Slitting the Expansion Slots in Aluminum-alloy Pistons

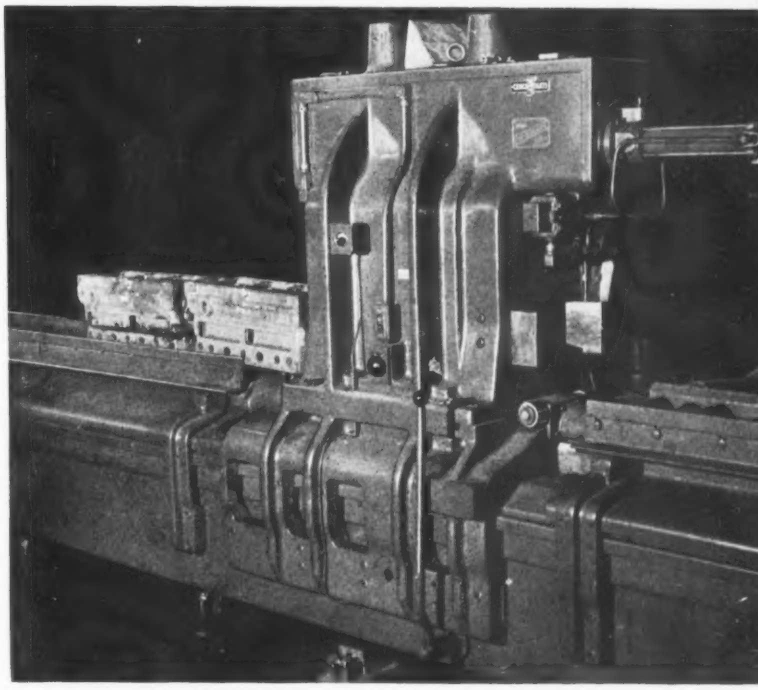
tons are loaded at the front of the table by slipping the piston-pin holes over a plug on each fixture, seating the skirt end against a vertical face, and applying a clamp against the closed end.

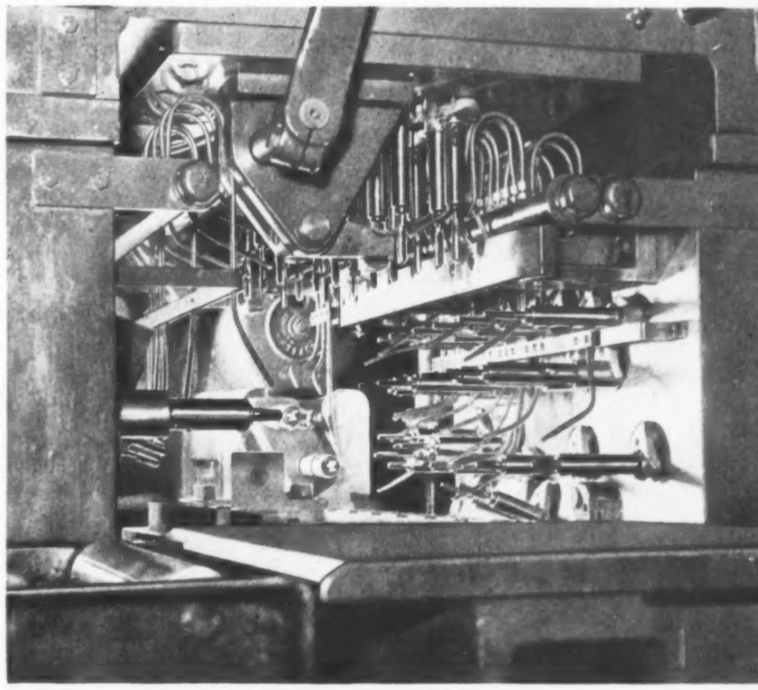
In the first working station at the left, two spindles on horizontal heads are fed rapidly toward each other for drilling small holes that will form the ends of an expansion slot to be cut in the next station of the machine, parallel with the piston-ring grooves. The cutting of the slot is accomplished by means of a 6-inch diameter slitting saw on the upper tool-head of the machine. At the same time, the small-diameter saw seen above the piston in the third working station comes down and cuts a short slot that connects the long expansion slot with a hole that has previously been drilled in the skirt end of the piston.

The bearing locks and the half-round crankshaft bearings on the bottom side of the cylinder blocks are rough- and finish-broached by Cincinnati hydraulically operated broaching machines of the horizontal type, as shown in Fig. 10. The cylinder blocks are fed through these machines with the crankcase upward, the broaches being mounted above the cylinder blocks. Sixty blocks are broached per hour.

Two Greenlee machines of the design illustrated in Fig. 11 are employed for tapping the many holes in the cylinder blocks. As will be seen from the illustration, these machines are designed for feeding taps from the top, the two sides and one end, both straight in and at an angle.

Another interesting machine in the cylinder-block line is the Ingersoll milling machine shown in Fig. 12, which finishes the long manifold face, as well as oil-pump, distributor, oil relief, and angular pads on both sides of the cylinder blocks. Tool-heads on each side of the machine are fed crosswise to carry the cutters past the clamped cylinder block. The production rate on this job is 32 blocks an hour.





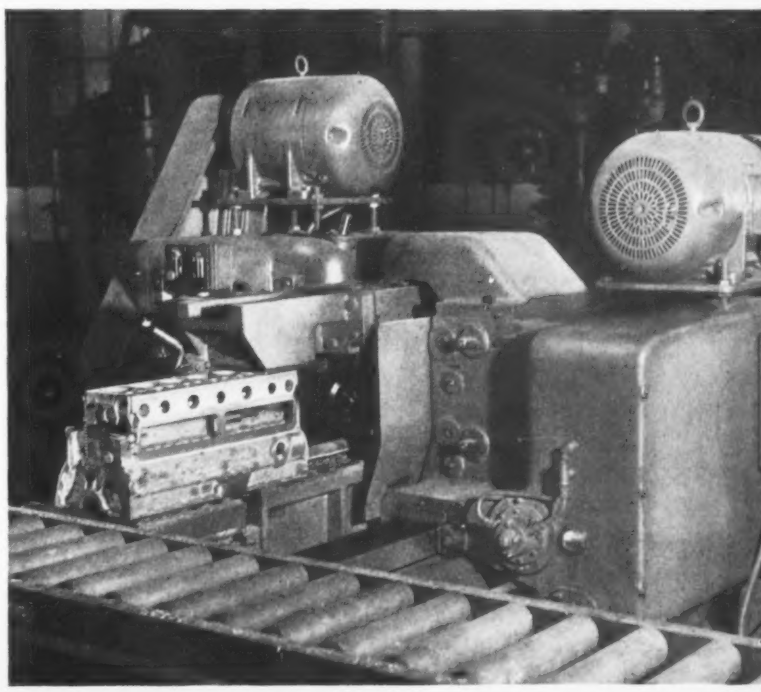


Fig. 10. (Top) "Hydro-Broach" Designed for Broaching the Bearing-lock Surfaces and the Half-round Main Bearings of Cylinder Blocks

Fig. 11. (Center) One of Two Special Machines Designed for Tapping the Numerous Holes in Cylinder Blocks

Fig. 12. (Bottom) Double-end Machine for Milling the Long Manifold Face and Various Pads on Opposite Sides of Cylinder Blocks

Chevrolet Connecting-

MACHINES of entirely new construction recently installed in the connecting-rod lines of the Chevrolet Motor Co., Flint, Mich., have made that department one of the most modern in the entire automotive industry. Wherever a number of operations could be combined, this principle was followed in planning the new equipment. Increased accuracy of a part generally results when a number of operations can be performed with one chucking, because, even though the part may be located and clamped from identical surfaces in a series of operations, dimensional differences usually occur due to minute differences in the setting of the work.

This is an important advantage of multiple tooling, in addition to the widely recognized advantages of reduced work-handling and increased production rates. Typical of the new equipment is the multiple-head indexing type of machine illustrated in Fig. 1, seven of which are used in the connecting-rod department. These machines perform a large number of drilling, reaming, milling, and tapping operations simultaneously on connecting-rods held in eleven stations of the indexing table. The machines are operated entirely by hydraulic means, and each one does the work previously performed by eleven machines, with a single chucking of the work.

When the connecting-rod and separate cap forgings reach the machine shop, they are shot-blasted and tumbled for ten minutes in equipment that takes a load of approximately 1200 rods at a time. The box skids on which the rods and caps are received are lifted by an elevator and automatically loaded into the hopper of this equipment. After they have been automatically unloaded from the hopper, the connecting-rods are straightened under a power press, and both the rods and caps are then coined under a second press. The stock allowed on the forgings for coining is 1/64 inch.

After the wrist-pin hole has been drilled in the connecting-rods, they reach the continuous broaching machine shown in Fig. 2, which is employed for rough-broaching the crankpin bearings, contact faces, and sides and bottom surfaces of the bolt

Rods Made by Ultra-Modern Methods

By CHARLES O. HERB

bosses. The machine is equipped with fixtures that are carried by link chains across the top of the machine, drawing the connecting-rods under broaches mounted in a stationary horizontal head. The fixtures return through the bed to the starting end of the machine, the finished rods being automatically discharged immediately after they pass from under the broaching head at the far end.

The connecting-rods are loaded horizontally into the open fixtures when they come up at the front end of the machine. They are automatically clamped after the fixtures reach the top of the machine and the rods are suspended vertically, the rods being pushed solidly on locating seats as they pass under an arm attached to the front end of the broaching head. If a connecting-rod should reach the broaching head improperly loaded, a dog would be actuated to stop the machine and prevent damage to the equipment. The broach is 60 inches long.

Immediately after the broaching operation, one side of both the crankpin and wrist-pin ends is ground for locating purposes by the machine shown in Fig. 3. About sixty rods can be held at one time in the fixtures of the continuously revolving table which carries the work beneath grinding wheels mounted on three vertical heads. The crankpin end is ground by two wheels, and the wrist-pin end by one wheel. The wrist-pin end of each rod is clamped against a V-block by an arm that is automatically applied against the crankpin end. This end is held between hardened and ground flat surfaces.

The grinding wheels are automatically dressed and adjusted downward to compensate for the removal of abrasive in each dressing. When the wheels have been dressed the maximum amount, red lights indicate the need for new wheels.

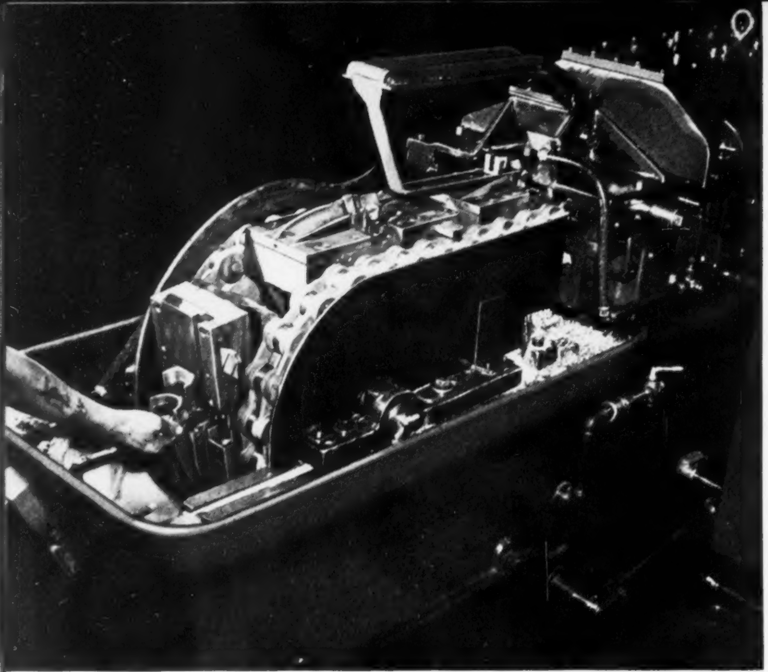
Four connecting-rods are broached simultaneously through the wrist-pin bearing by the machine shown in Fig. 4, which is equipped with an indexing fixture that enables four rods to be loaded at the front of the machine while four others are being broached. The crankpin ends of the rods are located in the fixture from the broached contact faces, and the wrist-pin ends are accurately positioned by pilots on the lower end of the broaches. The operation is performed as the broaches are pulled through the rods by a head in the base of the machine. The retrieving head above the table is applied simply for lifting the broaches into the starting position at the end of an operation and lowering them again for the next operation.

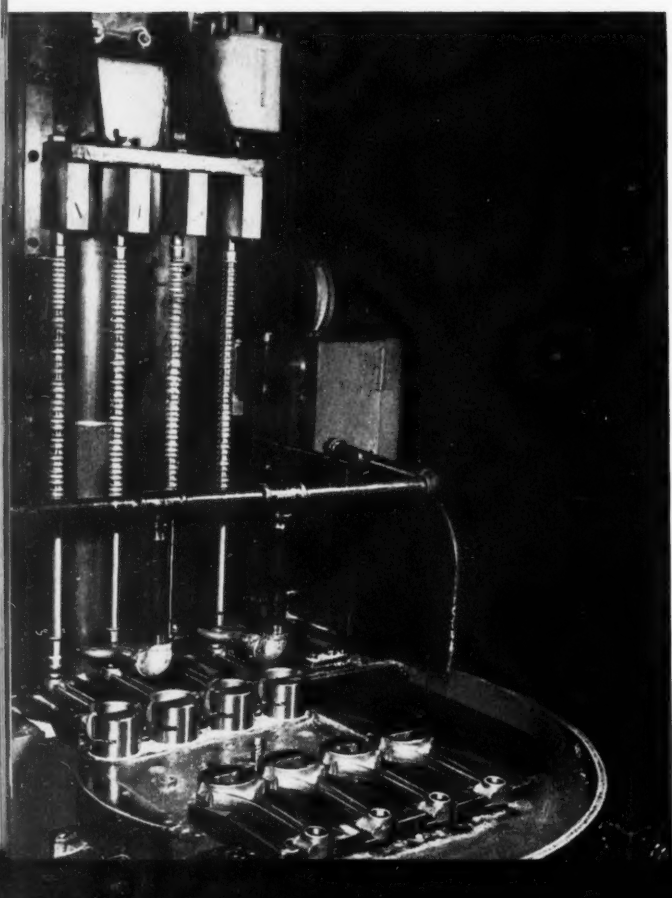
Broaching occurs with every second cycle of the table indexing, the index movement in between being utilized to raise the broaches to the starting position. All movements of the machine, including indexing of the fixture, are actuated hydraulically.

The surfaces on the crankpin end of the connecting-rods that were broached by the machine illustrated in Fig. 2 are next finish-broached by a machine of similar but lighter construction, equipped with a broach having an over-all length of 24 inches. At the end of that operation, the distance between the center line of the wrist-pin bearing and the contact faces of the crankpin bearing end must be as specified within 0.005 inch. Continuous broaching machines of the same general construction are employed for rough- and finish-broaching similar surfaces on the connecting-rod caps.

With various finished surfaces now accurately established, the connecting-rods are ready for the

Fig. 1. Multiple-head Machine which Performs a Large Number of Operations on Connecting-rods





CONNECTING-RODS MADE BY

large multiple-head machines of the type shown in Fig. 1. Each of these machines has a loading station and eleven working stations. Two connecting-rods are mounted at a time on each of the fixtures. The loading station is shown at the left in Fig. 5; it will be seen that the connecting-rods are loaded vertically, with the wrist-pin end located over a hardened and ground plug and gripped by hand-operated clamps. The crankpin ends are located from the broached contact faces and bolt-lug sides, and also from the boss face ground in the machine shown in Fig. 3. Clamping of this end is accomplished by applying a power-driven socket wrench on an overhead spindle of the machine to the head of a screw projecting from the top of each work-fixture. This wrench is actuated by a lever.

In the first working station, which is seen at the right of the loading station, two drills on an inclined head mounted on the machine column are fed downward for drilling a pinch-bolt hole one-half the required distance in the wrist-pin end of the connecting-rods. Bushings for guiding these drills are moved into place over the pinch-bolt bosses by the horizontal slide on the front of the machine base. It was necessary to employ retractable bushings for this operation, because bushings permanently mounted on the fixtures would interfere with some of the succeeding operations.

In the second working station, a horizontal head on the front of the machine base, as seen at the extreme right in Fig. 5, advances two end-mills that are held with their cutting ends uppermost, into line with the connecting-rods and then feeds these cutters sidewise for milling semicircular clearances on the bottom side of one bolt lug on each rod. In this way, flat surfaces are provided at the points where the drills will break through when the bolt holes are drilled, and drill breakage is avoided.

The two pinch-bolt holes partly drilled in the first working station are drilled completely through in the third working station by an inclined head on the machine column which may be seen in Fig. 1. Bushings are not required for this operation, as the drills are guided by the partly drilled holes. The connecting-rods are then indexed to the fourth working station, which is seen at the extreme left in Fig. 6, where end-mills inverted on a horizontal

Fig. 2. (Top) Continuous Type of Machine for Broaching Crankpin End of Connecting-rods

Fig. 3. (Center) Grinding One Side of the Crankpin Bearing and Wrist-pin Boss

Fig. 4. (Bottom) Simultaneously Broaching the Wrist-pin End of Four Connecting-rods

head mill a clearance around the under side of the opposite bolt lug of each rod not milled in the second station. At the same time, two bolt holes are drilled half way through the bosses at the crankpin end by drills on a vertical head on the column.

In the fifth working station, seen in the center of Fig. 6, the four bolt holes of the two connecting-rods are chamfered, and, at the same time, tools on a horizontal head on the machine base slit the pinch-bolt boss of one rod and mill the top of this boss. The other connecting-rod is similarly machined in the seventh working station.

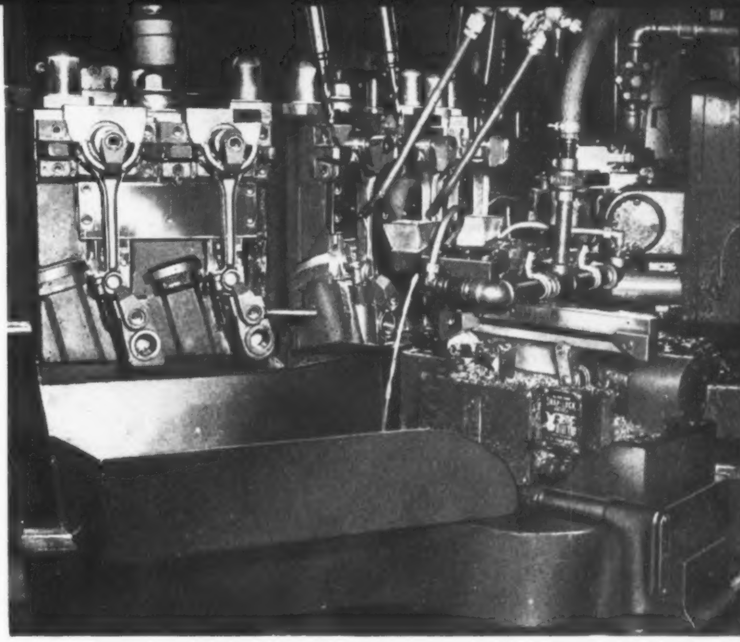
When the connecting-rods reach the sixth station, which is seen at the right in Fig. 6, the bolt holes are drilled completely through by a vertical head on the column, and at the same time the pinch-bolt holes are chamfered by spindles fed upward at an angle from the base of the machine. The cutters that slit and mill the pinch-bolt boss of the second connecting-rod in the seventh working station can be seen at the left in Fig. 7.

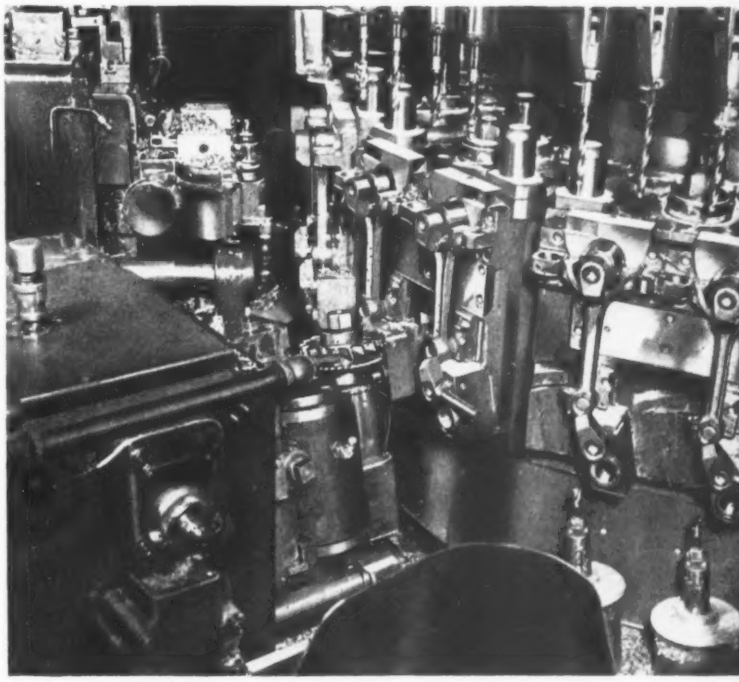
In the eighth working station, which is also seen in Fig. 7, the under sides of the four bolt holes are chamfered by four countersinks, mounted in an inverted position on a horizontal slide. This slide has a tool-head that moves upward after the countersinks have advanced into the operating position.

In the ninth working station, which can be seen in the background in Fig. 7, a similar head equipped with four cutters spot-faces the under side of the bolt bosses. Taps mounted on an inclined head on the column are employed in the tenth working station to tap the pinch-bolt hole of each connecting-rod, and in the final working station, reamers on a vertical head finish-ream the bolt holes.

This battery of machines is installed in two rows along opposite sides of the covered conveyor shown in Fig. 8, to which all chips and coolant are carried from the machines by troughs. The coolant flows along the conveyor to a floor pit, while a link chain carries the chips to the same pit. A vertical bucket conveyor then transfers the chips to the overhead hopper seen in the illustration, from which they can be conveniently loaded in box type skids.

In Fig. 9 is shown a machine employed for operations on the connecting-rod caps. Two caps are loaded in each station of the indexing fixture; and





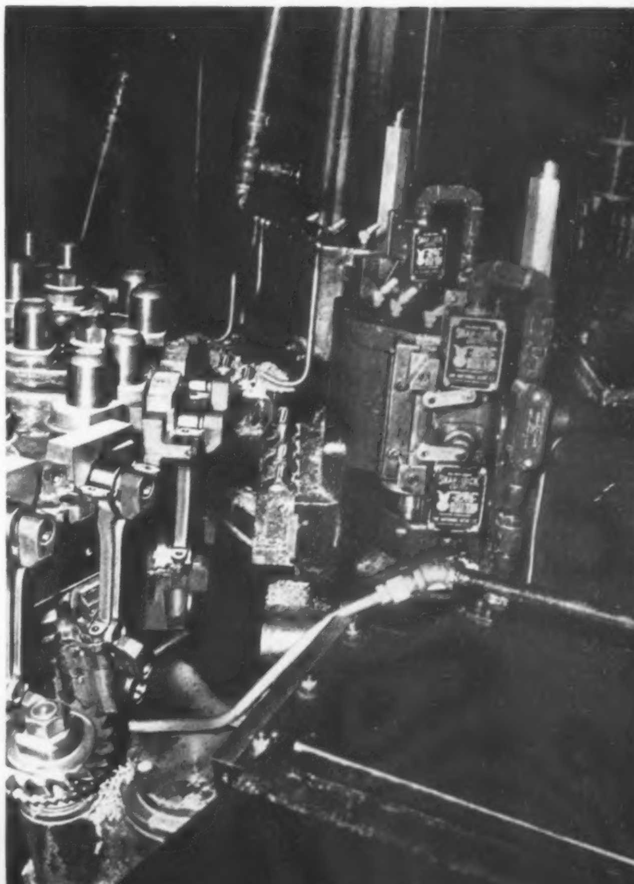
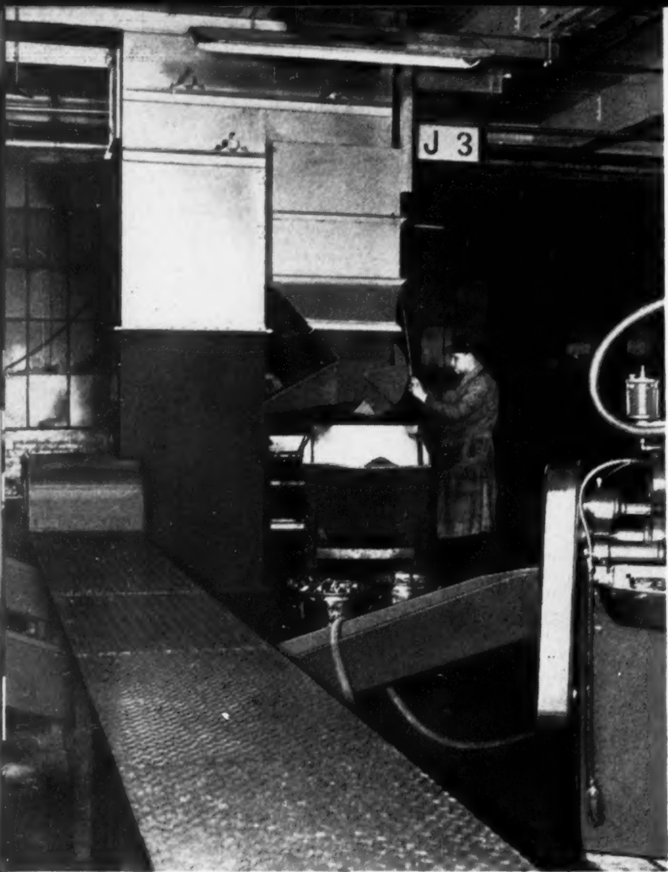
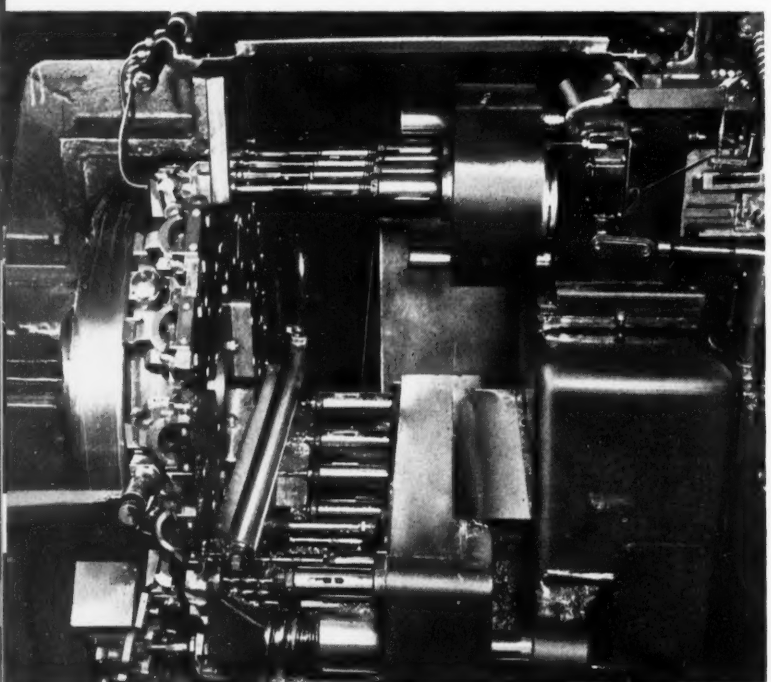


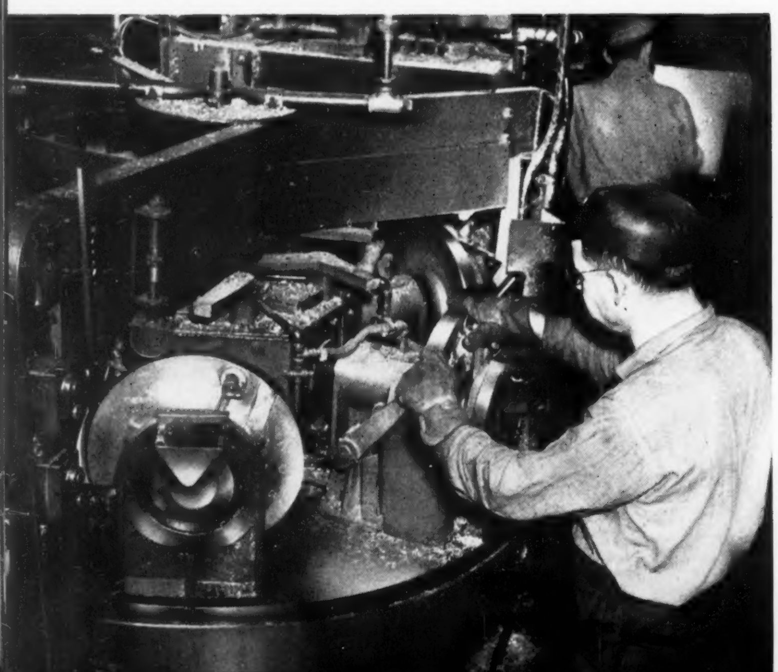
Fig. 5. (Top) Loading and First Two Working Stations of Machine Seen in Fig. 1

Fig. 6. (Center) Fourth, Fifth, and Sixth Stations of the Machine Shown in Fig. 1

Fig. 7. (Bottom) Seventh, Eighth, and Ninth Stations of the Multiple-head Machine







as they reach the first working station at the lower front of the machine, the bolt holes are drilled half way through both caps. In the next station, the bolt holes are finish-drilled, after which they are chamfered and spot-faced by tools that advance through the fixture from the left-hand end of the machine, and are finally reamed by the tools seen in the top position of the machine. The caps are automatically clamped by a cam arrangement before reaching the first working station, and are automatically released when they return to the loading station.

After the caps have been assembled to the connecting-rods, the assembled parts are cleaned electrolytically, pickled, and tinned preparatory to babbitting which is accomplished in the continuous type centrifugal casting machine shown in Fig. 10. The rotary table of this machine is equipped with fixtures having faceplates on which the connecting-rods are mounted singly in a vertical plane. In the loading station, the faceplates are stationary, but they are spun at about 750 R.P.M. as they approach the babbitt-pouring station and during cooling.

A babbitt melting pot located above the machine is maintained at a temperature of 825 degrees F. Each time a fixture reaches the pouring station, a measured amount of molten babbitt is discharged into a funnel at the front of the fixture which leads to an opening in the center of the crankpin bearing of the connecting-rod. Thus, the molten babbitt is evenly distributed around this bearing, and cools to a uniform thickness as the fixture keeps on revolving at high speed. Stellite pieces of conical shape are seated on the previously chamfered edges of the crankpin bearing to retain the babbitt.

Both before and after babbitting, the connecting-rods are chamfered on both ends of the crankpin bearing by the machine shown in Fig. 12. This machine has a constantly revolving drum designed to hold six connecting-rods. As the drum revolves, tool-spindles on heads at opposite sides of the machine feed chamfering cutters against both ends of the crankpin bearings on all rods, with the result that each rod is finished as it returns to the front of the machine.

In Fig. 11 is shown an unusual machine which drills the oil-hole through the lower side of the

Fig. 8. (Top) Conveyor Line and Hopper which Facilitate Disposal of Coolant and Chips

Fig. 9. (Center) Drilling, Reaming, Countersinking, and Spot-facing Connecting-rod Caps

Fig. 10. (Bottom) Rotary Type of Machine for Casting Babbitt in Connecting-rods

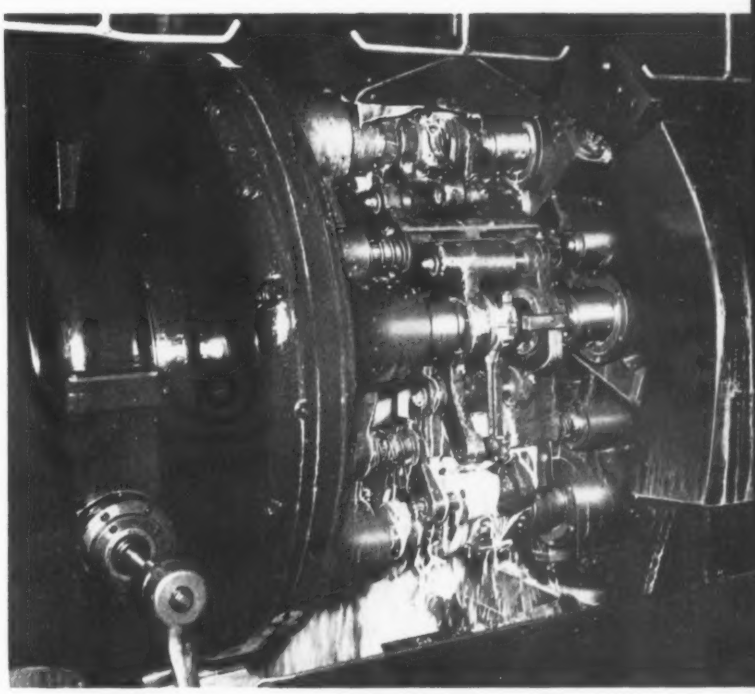
crankpin boss on the connecting-rods, drills an oil-hole in the cap, mills a groove around the crankpin bearing, mills a relief on both sides of the crankpin bearing, mills an oil relief groove in the cap, and cuts through the babbitt on both sides of the crankpin bearing to sever the cap from the rod.

Two connecting-rods are loaded in each of the eight stations on the indexing fixture. The relief on both sides of the crankpin bearing is milled by the horizontal head seen at the rear top of the machine, which has two cutters that are first fed forward into the connecting-rods. The head then moves to one side for milling the relief on one side of the crankpin bearing on both rods, after which it moves in the opposite direction for milling the relief on the other side of both rods.

The circular groove is cut by a tool on a horizontal head at the rear bottom of the machine. The tool is fed into the connecting-rod and then expanded while making three or four revolutions around the crankpin bearing, after which it is contracted and returned to its starting position. The angular heads seen at the front and back of the machine drill the oil-holes, while the horizontal head in the immediate foreground applies a slitting saw to cut the rods and caps apart. Accurate location of the connecting-rods is insured by a swinging device at the front of the machine, which is not visible in the illustration. The rods are automatically clamped.

Six machines of the type shown in Fig. 13 have been installed for precision-boring both ends of four connecting-rods at a time. The table fixture is provided with eight loading stations, so that four connecting-rods can be loaded while a similar number are being bored. Tungsten-carbide tools are used for boring the steel wrist-pin bearings, and diamond tools for boring the babbitted crankpin bearings. The boring of the crankpin bearings is completed before the boring of the wrist-pin ends is started. Both the boring head and the table are hydraulically operated.

The crankpin end of the connecting-rod is located between hardened plugs, and a plug is automatically raised into each wrist-pin bore to positively locate that end. After clamps have been automatically applied, the locating plugs are automatically lowered from the wrist-pin bores.



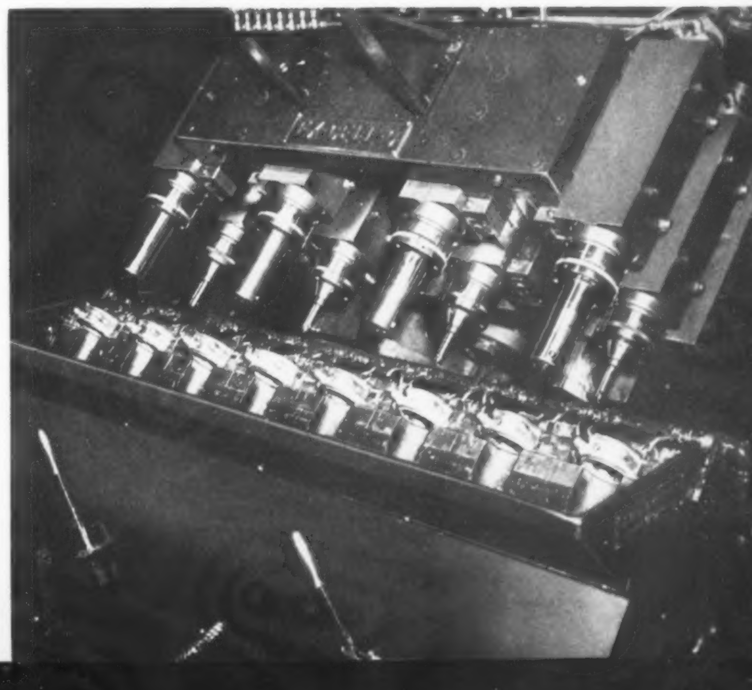
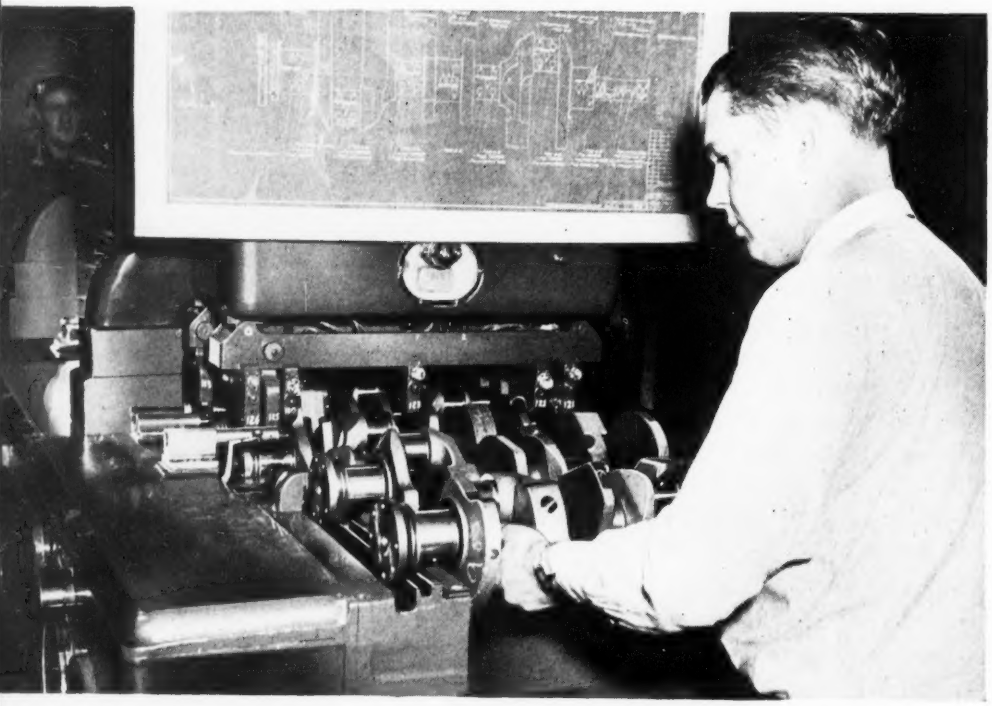


Fig. 11. (Top) Machine which Performs Drilling and Milling Operations on Connecting-rods

Fig. 12. (Center) Machine Employed for Chamfering Both Ends of the Crankpin Bearings

Fig. 13. (Bottom) Precision-boring the Crankpin and Wrist-pin Bearings of Four Rods

Fifteen Thousand



A Completely Automatic Machine Checks Fifty Elements on Each Crankshaft and Tells Why Rejected Crankshafts Fail to Meet Requirements

DESIGNING ability of the highest degree is manifested in the completely automatic machine recently developed by the Ford Motor Co., Dearborn, Mich., for inspecting automobile crankshafts. This machine checks fifty different elements on each crankshaft at the rate of 300 crankshafts an hour. In other words, 250 inspections are made a minute, or 15,000 an hour. Not only does the machine reject each crankshaft that fails to meet inspection requirements in any particular, but it also marks the crankshaft in such a manner as to definitely inform the operator of the reason why it was rejected.

An ingenious mechanism for moving the crankshafts through the machine and holding them momentarily in the twelve inspection stations has been combined with electrical devices for checking the various measurements and actuating plungers that mark rejected surfaces with ink. A general view of this unusual machine is shown in Fig. 2. It is installed in a glass-enclosed, temperature-controlled room to which the crankshafts are brought by an overhead conveyor, which also carries them away after inspection.

The crankshafts are loaded into the right-hand end of this machine, as shown in Fig. 1, being rolled by the operator along flat ways or tracks that support the crankshaft at the ends. Until the preceding crankshaft has been advanced into the first inspection station, it is impossible to roll a new crankshaft onto the intermittently operated conveyor that carries the crankshafts through the machine. This is prevented by horizontal plungers which project from housings on both sides of the machine, and obstruct the movement of the crankshaft. When the preceding crankshaft is advanced into the first inspection station, these plungers are withdrawn through the operation of two solenoids.

The crankshaft is then rolled onto two vertical plungers that move downward to lower it onto the conveyors extending along both sides of the machine. Before these plungers can be operated, however, the crankshaft must be located properly both lengthwise and sidewise against three stops. Two of these stops are directly in the path of the crankshaft ends and have small button switches that must be depressed by the crankshaft, thus insuring that it is properly lined up across the machine. There is also a bracket with a switch that must be depressed by the No. 1 crankpin to insure that the angular setting of the crankshaft is correct. When all three contacts have been made, a relay is energized and the two plungers that support the crankshaft are allowed to lower it to the two indexing conveyors.

The link type conveyor on the right-hand side of the machine is provided with fixtures machined to suit the flywheel end of the crankshaft, and with ball bearings on which the crankshafts rest. The left-hand conveyor is also provided with ball bear-

Inspections per Hour on Ford Crankshafts

ings to suit the front end of the crankshaft. Both conveyors are of the continuous type, extending to the far end of the machine and then back to the starting point through the machine bed.

In the first inspection station, which is seen at the front of the crankshaft in Fig. 3, gages check the spacing or the distance of the gear seat, the Nos. 1 and 2 crankpins, and the center bearing from the flywheel thrust face. This thrust face is held against a tungsten-carbide insert in a rail by means of a spring which is applied against one of the cheeks. The four gages of this inspection station are supported by brackets attached to the upper head of the machine and have gaging points that touch the surfaces being checked.

If the surfaces being inspected are the correct distance from the flywheel thrust face within the required limits, the electrical contacts within the gage will be depressed such an amount that no electrical connection will be made. If the spacing of any of the surfaces being inspected is too far from the thrust face, the corresponding contact point will be insufficiently depressed; and if the distance is too short, the contact point will be depressed too much. In either case, an electric relay will be energized to operate a solenoid which will cause a plunger to rise and make an ink imprint against each surface that is not spaced the required distance from the flywheel thrust face. Marking plungers of a similar type, which can be operated upward, downward, or sidewise, are provided for each element checked in all inspection stations.

Each time that a marking plunger is actuated against the work, a plunger is set in the conveyor fixture, which causes a buzzer to operate and a blue light to flash on when the rejected crankshaft reaches the operator seen at the unloading end of the machine in the heading illustration. In this way, he is warned of all rejected work.

When the conveyors carry the crankshafts to the second inspection station, one of the crankpins

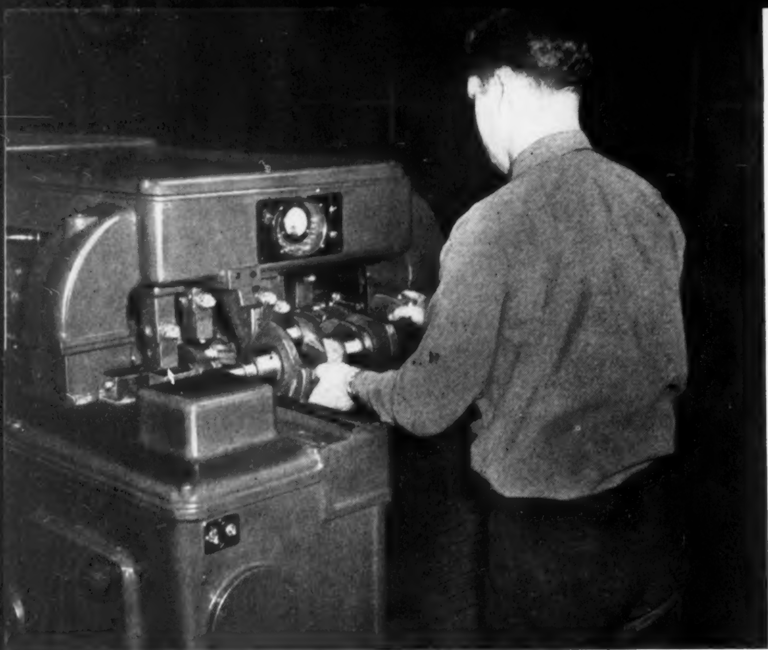


Fig. 1. An Operator Rolls Each Crankshaft to the Loading Station of the Automatic Inspection Machine, where it Must Contact with Three Electrical Buttons to Insure Correct Positioning

rides up an inclined track or stationary cam, which causes the crankshaft to turn through 90 degrees, bringing other crankpins in contact with gaging units fastened to the upper head of the machine. The same method is employed in indexing to each succeeding station, except the eleventh and twelfth stations. One of these inclined tracks or cams may be seen at the right-hand end of the crankshaft in Fig. 3, which is shown in the second inspection station.

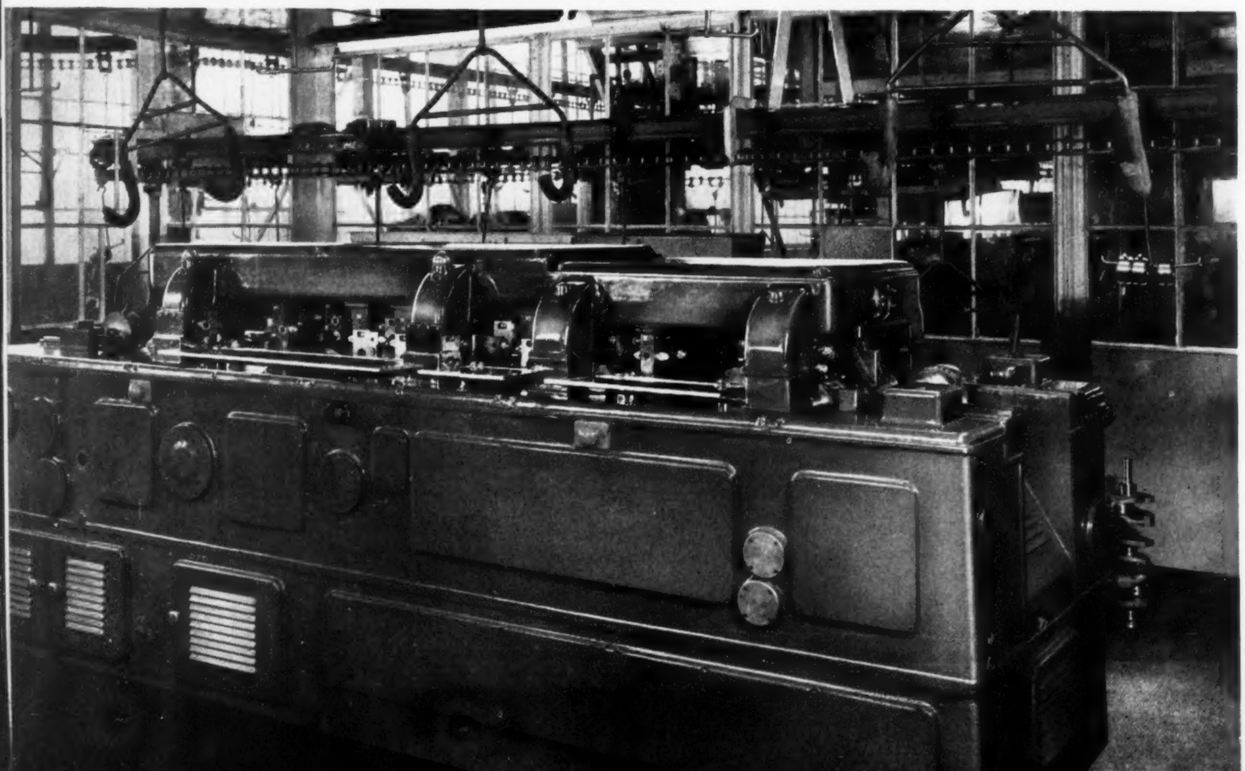
The inspection operations in the next three stations are similar to that performed in the first station in that various crankshaft elements are checked by gage units suspended from the stationary upper head of the machine. In each case, contact points on these gage units energize relays and solenoid switches to mark any surface that does not meet inspection requirements.

In the second inspection station, a check is made on the width of the Nos. 2 and 4 crankpins, the center bearing, and the flywheel pilot face. In the third station, a check is made on the spacing of the front main bearing and the Nos. 3 and 4 crankpins in relation to the flywheel thrust face, and the over-all length is checked with respect to that face. The widths of the Nos. 1 and 3 crankpins and of the rear bearing are checked in the fourth inspection station.

From now on, all the gaging units are mounted on a vertically moving head, as shown in Fig. 4, because these units check diameters, and it must be possible to raise them for indexing the crankshafts and lower them over the various surfaces for inspection. Each diameter is checked twice at points 90 degrees apart, so as to be sure that the diameter is the same all around each cylindrical element of the crankshaft. For example, the diameter of the No. 1 crankpin is inspected in the fifth and also in the eighth station.

In addition to the No. 1 crankpin, the No. 2 crankpin, the gear pilot, the center bearing, and the rear bearing are all checked for diameter in the fifth station. Then, in the sixth station the front bearing, the Nos. 2 and 4 crankpins, and the rear bearing are checked for diameter; in the seventh station the pulley seat, front bearing, Nos. 3 and 4 crankpins, and flywheel pilot are checked for diameter; and in the eighth station the pulley seat, Nos. 1 and 3 crankpins, and the center bearing are checked for diameter.

Fig. 2. Completely Automatic Machine which Inspects Fifty Different Elements on Ford Crankshafts at the Rate of 300 Crankshafts an Hour



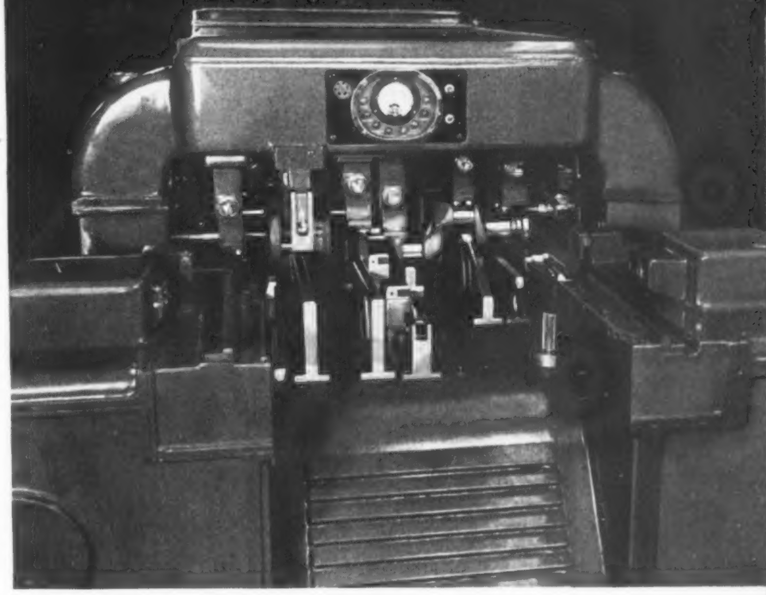


Fig. 3. Inspection Machine from the Starting End, the Crankshaft being Shown in the Second Inspection Station: the Inclined Track at the Right Causes the Part to Rotate through 90 Degrees

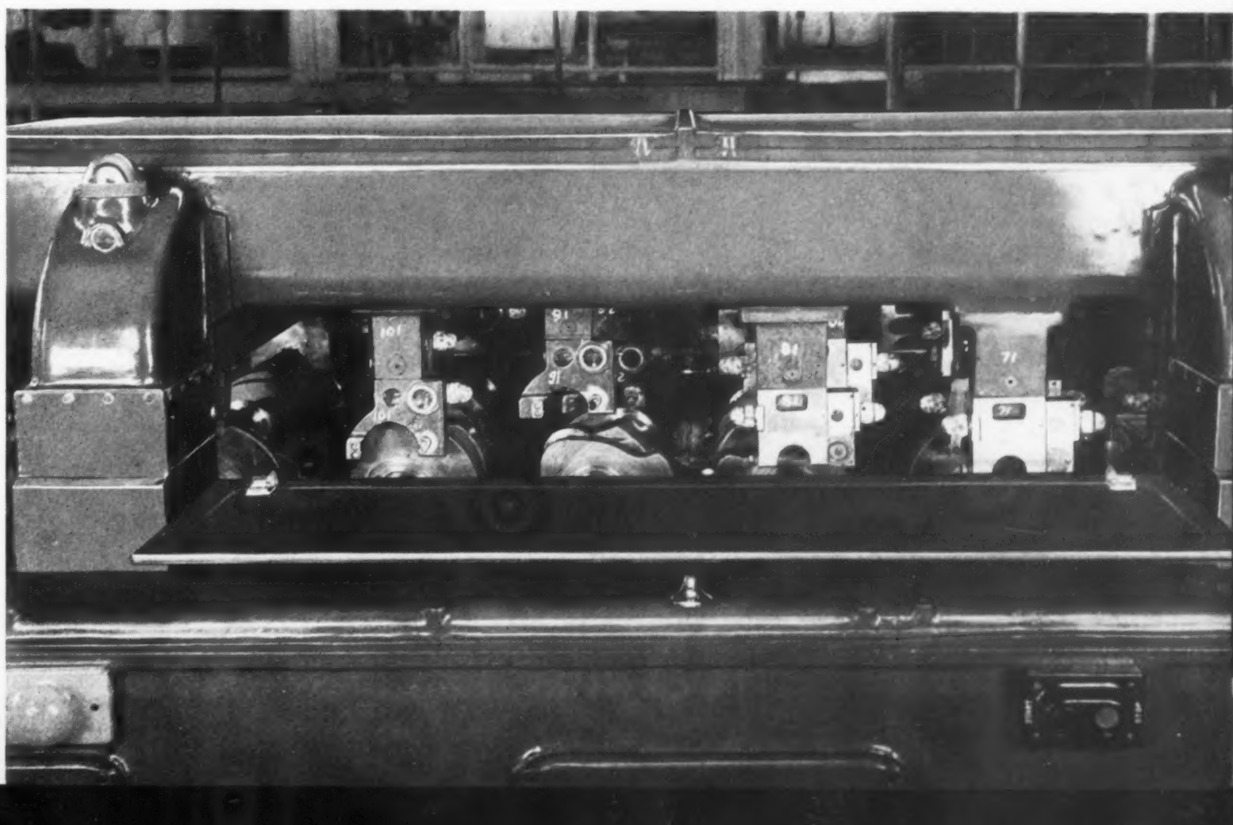
In each of these stations, the gaging units are of a floating design, which permits them to tilt slightly in the event that the conveyors do not stop the crankshaft exactly in the center of the gages. There is a contact point on each side of these gaging units, which are similar in appearance to snap gages, one contact point being in a fixed position and the other free to slide an amount corresponding to the diameter of the work. The sliding contact point serves to energize a relay and solenoid to operate a marking plunger, which if it moves too little, indicates a diameter below the minimum limit, and if it moves too much, indicates a diameter greater than the maximum limit.

In the ninth inspection station, which is seen at the extreme left in Fig. 4, the Nos. 1 and 3 crankpins, the center bearing, and the rear bearing are checked for taper; and in the tenth station, the front bearing and the Nos. 2 and 4 crankpins are also checked for taper. All the gaging units employed for taper inspection have a ball-joint suspension that permits them to float either around the crankshaft surfaces being checked or sidewise in relation to them. Any taper is detected by the four contact points provided on each gage unit, two on a side.

When the crankshaft reaches the eleventh and twelfth stations, seen in Fig. 5, they are revolved to permit any out-of-roundness or out-of-squareness of the surfaces to be detected. In each of these stations, the gaging units are mounted on a floating overhead bar which is also attached to the vertical-moving inspection head of the machine. In the eleventh station, the concentricity of the gear pilot and the squareness of the flywheel thrust and pilot faces are checked. In the twelfth station, inspections are made on the concentricity of the pulley seat, center bearing, and flywheel pilot, on the roundness of the front and rear bearings, on the squareness of the rear thrust face, and on the clearance of the crank-cheek fillets. The limit on out-of-roundness is 0.0005 inch in some cases, and 0.001 inch in others. Several of the markers can be seen along the right-hand end of the crankshafts in Fig. 5, and one is shown projecting upward from the bed.

After each crankshaft leaves the twelfth station, it is carried to two elevating devices, one of which may be seen at the extreme left in Fig. 5. These devices raise the inspected crankshaft from the

Fig. 4. View of the Vertically Moving Head on which All Inspection Stations of the Machine from Fifth to Twelfth, Inclusive, are Mounted



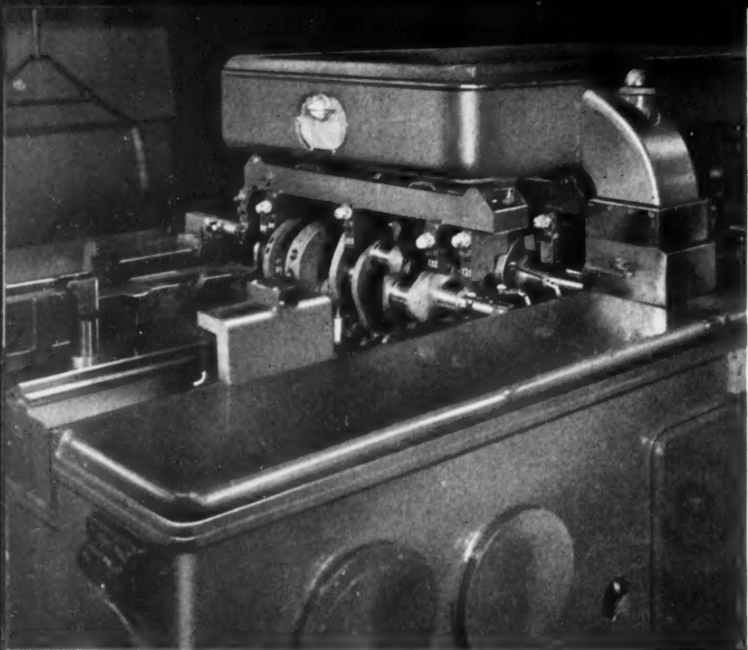


Fig. 5. Discharging End of Machine, where an Electric Buzzer Operates and a Blue Light Flashes to Indicate a Rejected Crankshaft

conveyors into line with short tracks that lead to the discharging end of the machine. Until the operator at that end of the machine removes an inspected crankshaft from these elevators, the machine is prevented from indexing, thus placing the operation of the machine under the control of the unloading inspector.

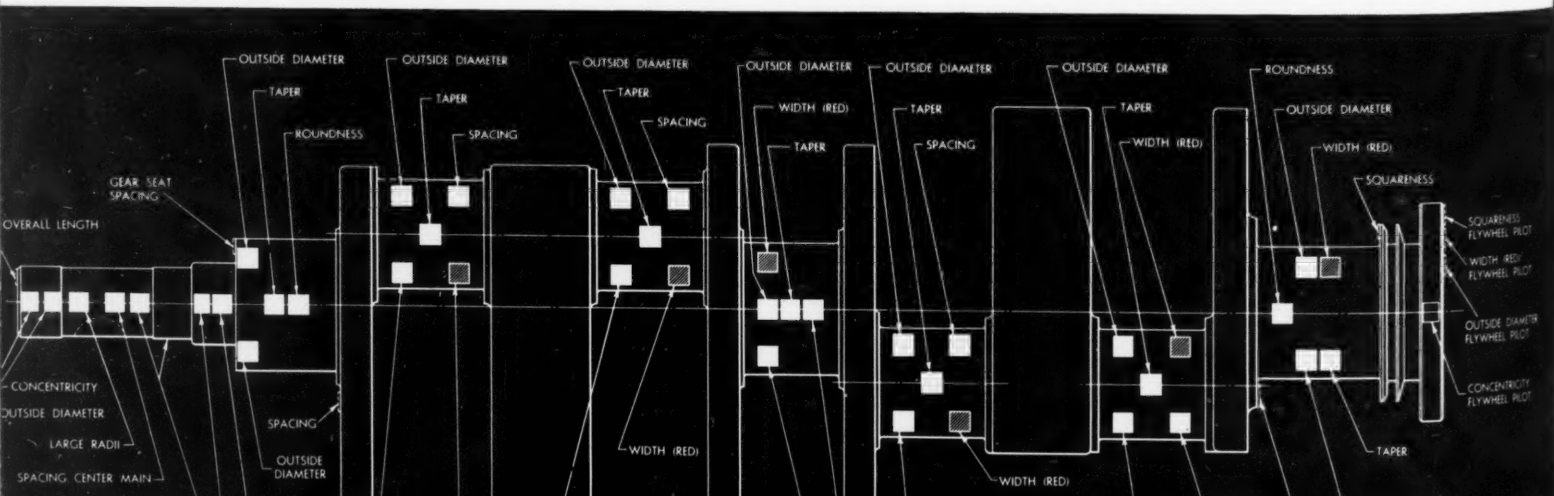
Safety devices are provided throughout this inspection machine to make the equipment completely fool-proof and prevent any damage to the various mechanisms. Whenever the machine stops for any reason whatsoever, a small electric bulb lights up on the panel on the head of the machine at the loading end, as seen in Fig. 1. The light will go on, for example, if there is no crankshaft in the loading station; if the windows on the sides of the machine have been opened for examining the gage contacts; if safety switches have been disengaged; if any of the solenoids is out of order; or if the direct current which actuates the relays fails.

As previously mentioned, the unloading inspector is apprised of any defective shaft by the operation of a buzzer and the lighting of an electric bulb. He then turns that crankshaft over to observe the location of any ink marks; and by noting the blueprint mounted above the machine, as seen in the heading illustration, he can immediately determine why the crankshaft was rejected.

This blueprint has markings similar to those shown in Fig. 6. Markings on the left-hand side of a bearing, as seen in this illustration, indicate that the diameter is not within the required limits; markings in the middle of the bearing indicate a tapered condition; while markings on the right-hand side indicate that there is either an error in the spacing of the bearing from the flywheel thrust face or in the width of the bearing. If the error is in the width of a bearing, the marking is in red ink, whereas all other marks are in blue ink. There are, of course, no marks on the crankshafts that pass all inspections.

The inspection machine itself is a model of compactness and neat design. There are over 6000 parts in the machine, and more than 8000 feet of wire, of which not one inch is exposed. Approximately seventy relays operate as many solenoid switches, and there are amplifiers for the eleventh and twelfth stations, because the time of contact between the revolving crankshaft and the gaging points occasioned by out-of-round or out-of-square surfaces would not otherwise be long enough to energize the relays. The energizing of the relays would require a contact lasting two-hundredths of a second, whereas with the amplifiers, ten-millionths of a second would be long enough.

Fig. 6. Diagram Mounted over the Discharging End of the Inspection Machine to Indicate to the Inspector the Meaning of Ink Marks on Any Rejected Crankshaft



Unique Tooling for Packard Water-Pump Bodies

THE bodies of the pumps employed for circulating water through the motors of Packard automobiles have an inside boss face that must be unusually smooth and at right angles to the hole through the boss within close limits. This boss surface may be seen in the center of the finished water-pump casting at the right in Fig. 2. The high degree of finish necessary on this surface is obtained through a unique burnishing operation, which will be described after some of the preliminary operations have been discussed.

The first operation on the water-pump body consists of grinding the large joint face *A*, Fig. 1, on an Osterholm automatic surface grinder equipped

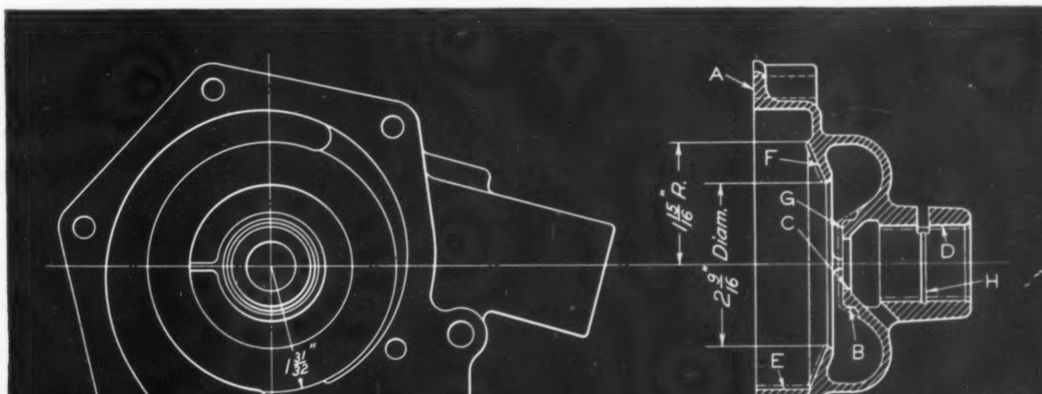


Fig. 1. Detailed Drawing of the Packard Water-pump Body, which Shows Location of the Internal Boss Surface that Must be Burnished

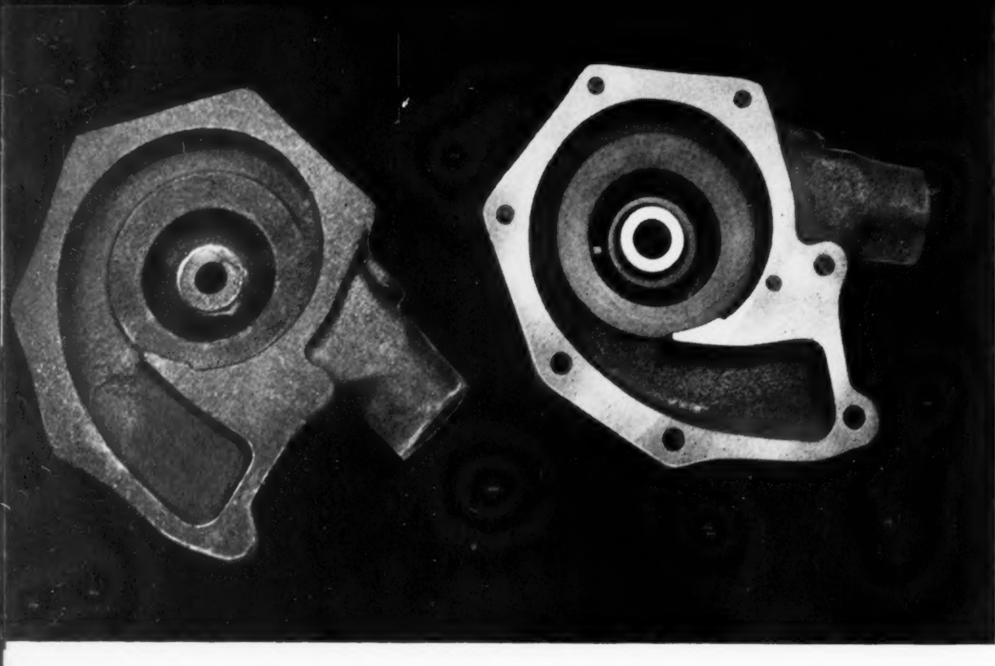


Fig. 2. Packard Water-pump Body Castings before and after the Machining Operations have been Performed

with a tilting fixture, as shown in Fig. 3. Two pump bodies and two pump impellers are held on this fixture at one time, and they are brought into line with the ring-wheel of the grinding machine by swinging the fixture upward into the vertical position. The wheel is then fed forward and the work oscillated several times across the grinding wheel in the conventional manner. When the castings leave the machine, their joint faces are flat within 0.002 inch. Dressers for the grinding wheel may be seen at the forward end of the fixture.

The water-pump bodies are next passed to the Morris double-end horizontal type of machine illustrated in Figs. 4 and 5, which is equipped with a four-station indexing fixture on which the castings are located from the ground joint face and held securely by hand-operated clamps. From the loading station seen at the front of the machine in Fig. 5, the castings are indexed downward to the first working station, where the tool-head at the bottom in Fig. 4 advances for drilling three 11/32-inch holes, four 13/32-inch holes, and one 5/16-incn hole through the flange bosses. A hollow-mill at the center of the tool-head turns surface *B*, Fig. 1,

Fig. 3. Grinding Operation Employed for Finishing Joint Faces on the Water-pump Body and Impeller Castings

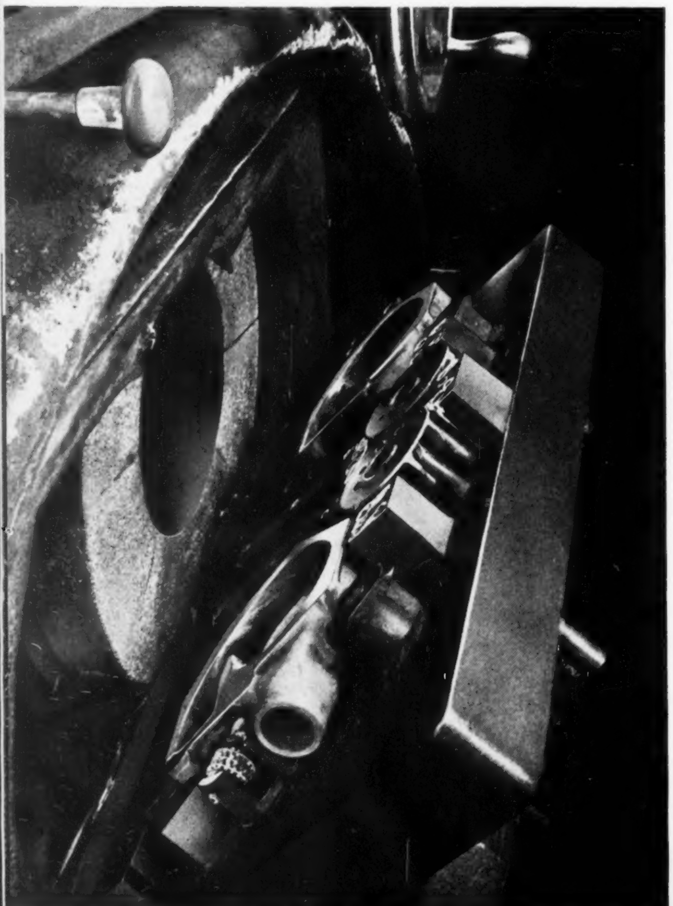
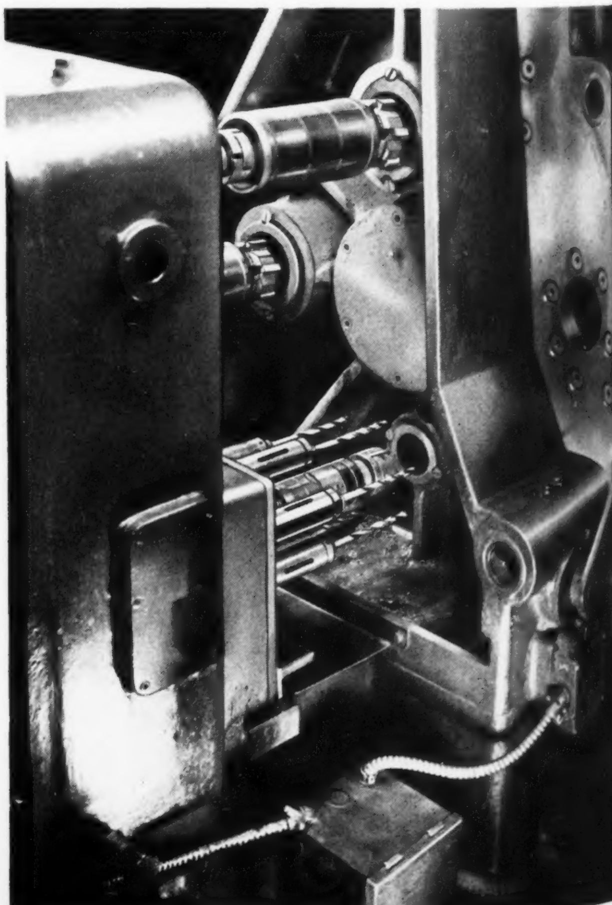


Fig. 4. Tools Provided on the Left-hand End of an Opposed-head Machine of the Indexing Type



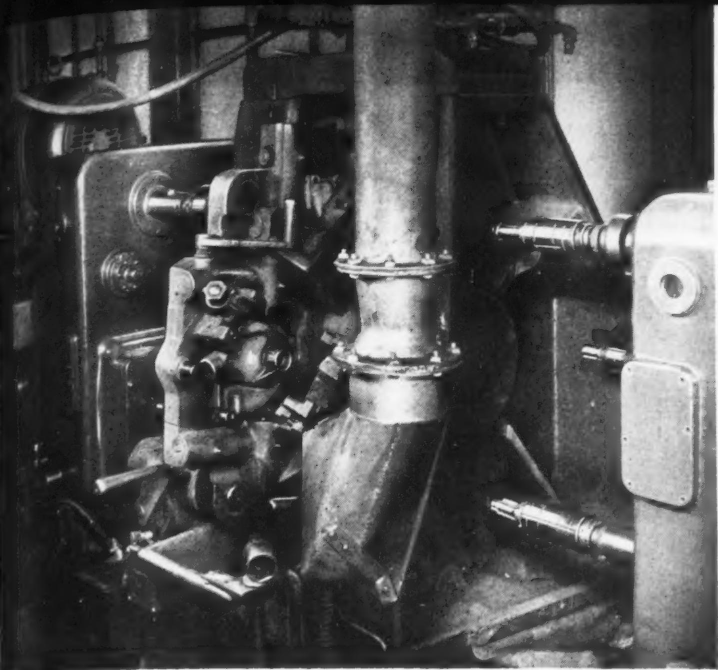


Fig. 5. View from the Right-hand Side of the Double-head Machine Employed for Drilling, Boring, and Spot-facing the Water-pump Bodies

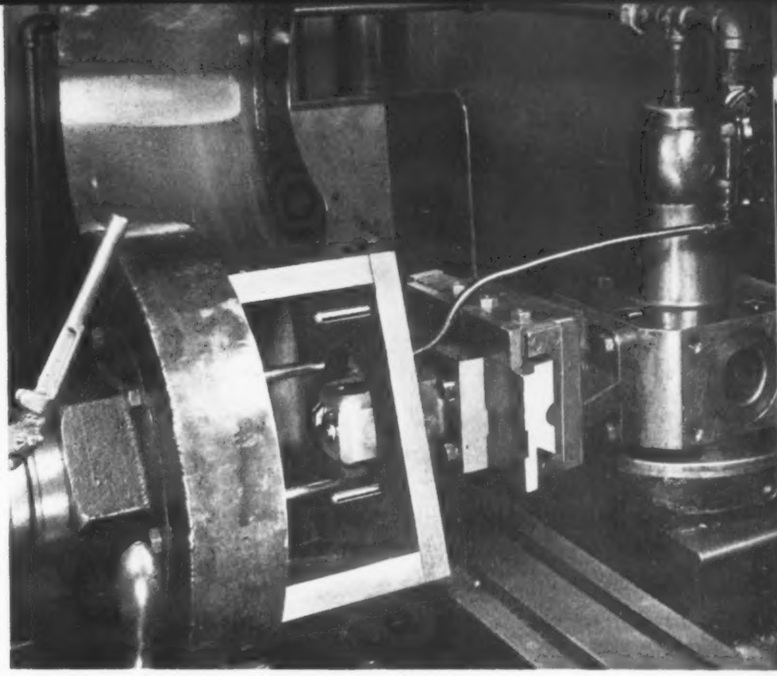


Fig. 6. Tooling Provided on a Machine Used for Finish-facing and Burnishing Surface G, Fig. 1, on the Inside of the Water-pump Bodies

around the boss on the inside of the casting and also chamfers the boss. At the same time, the core-drill seen at the lower right in Fig. 5 advances and drills the bores C and D, Fig. 1, to 25/32 inch and 1.140 inches, respectively.

In the second working station, at the rear of the machine, a tool on the left-hand head, as seen in Fig. 4, rough-bores surface E, Fig. 1, to a diameter of 3 29/32 inches, and faces the large seat F at an angle of 22 1/2 degrees. A cutter at the center of the same tool-head rough spot-faces surface G of the internal boss. At the same time, a tool on the right-hand head bores hole D to a diameter of 1.170 inches. The cutter blades that face seat F are Carboloy-tipped.

When the pump body has been indexed to the third and last working station of the machine, tools on the left-hand head finish-bore surface E to a diameter of 3 15/16 inches, finish-face the 22 1/2-degree seat F, and finish spot-face surface G. At the same time, shaft bearing D is "finish bore-reamed" to 1.1807 inches, within limits of plus 0.0005 minus 0.0000 inch. Stellite cutter blades are provided for finishing seat F, while the finish-boring and reaming cutter is of the Packard disk type described in an article published in September, 1936, MACHINERY, page 30.

Groove H is machined around the shaft bearing in a single-spindle drilling machine equipped with a tool that is automatically expanded radially after it has been fed down the required distance into the work. Then a heater hole is drilled and tapped in one side of the water-pump body, and a wire-locking slot milled through the shaft bearing boss, after which the water-pump castings reach the Potter & Johnston automatic shown in Fig. 6. In this machine, surface G, Fig. 1, is finish-faced by a Carboloy tool and burnished by a second Carboloy tool of special design. Both tools are mounted on a holder that is attached to a horizontal slide on one of the turret faces. The tools are fed across the surface to be finish-faced and burnished through a connection between the cross-slide of the machine and the slide on the turret face. The tools move from the inside of surface G to the outside.

The burnishing tool consists of a piece of Carboloy mounted in a cylindrical holder in the square tool-block seen in the illustration. The Carboloy piece is lapped to a rounded contour on the burnishing end. The cylindrical holder is held at an angle in the tool-block, so that new burnishing surfaces on the Carboloy tool are made available by merely adjusting the cylindrical holder around its center. In this way, ten settings of the Carboloy burnishing tool can be obtained before redressing is necessary.

Approximately 2000 water-pump bodies are burnished per setting of the tool, or 20,000 pieces per redressing. The surface burnished must be free from tool marks, and square with the axis of the shaft bearing within 0.001 inch. The burnishing tool is set from 0.0015 to 0.003 inch ahead of the finish-facing cutter.

The work is located on the chuck fixture by slipping two flange holes over dowel-pins at the front end of the fixture. Then an air valve is operated, which causes a plunger to advance from the back of the fixture into the machined shaft bearing of the work and clamp the casting against the ground joint face. This method of accurately locating the work prevents damage to the Carboloy facing and burnishing tools. Cleaning and washing operations then prepare the pump bodies for sub-assembly.

Ingenious Tool

THE tremendous progress achieved in automobile manufacturing practice since the early days of this industry can be credited in large measure to the ingenuity of the men responsible for the selection and tooling of production equipment. The tool engineers of automotive plants are constantly faced with the problem of designing special tools, jigs, fixtures, and machines to produce new parts or to increase the efficiency of methods in use. Accuracy of the finished work and economical manufacture in any plant depend upon the ability of the tool engineers in solving the production problems that arise.

Unusual tooling designed to meet production problems in the transmission shop of the Buick Motor Co., Flint, Mich., is described in this article. Fig. 1 shows a method devised for honing external conical surfaces of both clutch and second-speed transmission gears. The operation is performed on a Fellows gear shaper, which is fitted on the left-hand side with a ram that carries an abrasive stick of rectangular cross-section. The abrasive stick is brought into contact with the conical surface of the work, and held there by spring pressure while the ram makes reciprocations at the rate of 3600 strokes a minute. Mineral seal oil is used as a coolant. The springs provide a floating action that eliminates breakage of the abrasive stick.

The floating holder is guided in relation to the ram by pilot-pins on the ram which enter bushed holes in the holder. The work-spindle is set at an angle of 8 degrees, so as to bring the contact point between the abrasive stick and the surface being honed into a vertical plane. The work-spindle is run at 250 R.P.M. through special gearing.

While the honing operation is in progress, a piece of rubber-bonded abrasive wheel attached to a holder on the right-hand side of the fixture is pushed forward to polish a recess on the under side of the conical surface, ready to receive a spring wire. Also, the operator moves a lever to feed down an overhead Ramet-tipped tool which removes burrs from the top of the internal teeth on the work-piece. Both the honing ram and the holder at the right are air-actuated.

The block in which the abrasive stick is mounted can be adjusted minute amounts to compensate for wear of the stick. New abrasive sticks are 6 inches long, and they can be used down to a length of about 1 1/4 inches. They are 1/2 by 3/4 inch in cross-section. Quick stopping of the machine is obtained through a brake applied to the motor drive. Two hundred work-pieces are handled per hour in this operation.

A special work-head for Michigan gear shaving machines, designed to facilitate the handling of first-and-reverse transmission gears, is illustrated in Fig. 2. On a standard machine of this type, it is necessary to mount flat gears of the kind handled in this operation on an arbor, which is held between centers above the shaving rack. It was to eliminate the work involved in loading the gears on the arbor that the special work-head was designed.

This head is provided with a stub arbor, on which the work is slipped, as shown, and then a collar with a bayonet lock is placed on the end of a bar that extends the full length of the stub arbor and projects from the front end. The work is quickly clamped through the operation of an air cylinder located in the work-head directly above

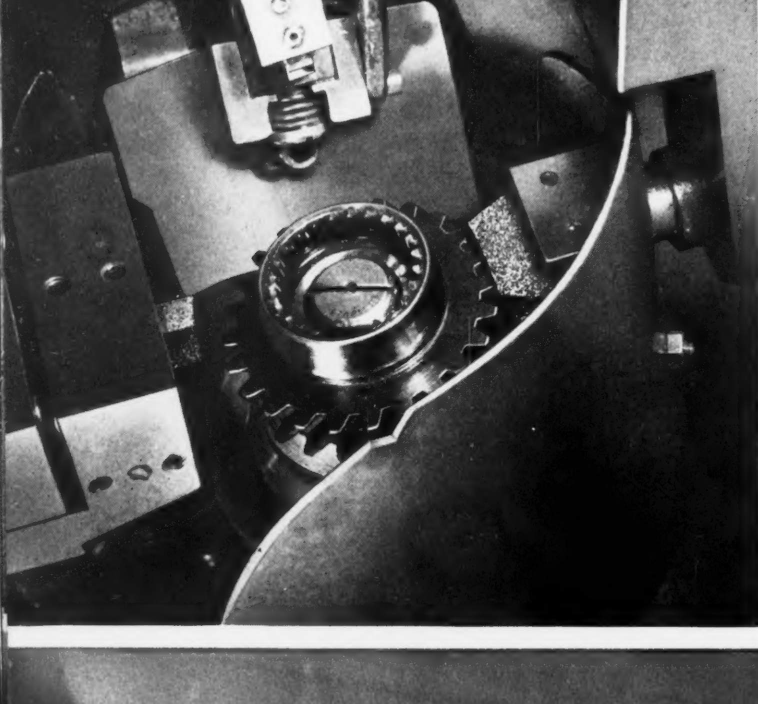


Fig. 1. Equipment Designed for an External Honing Operation on the Conical Surface of Clutch and Second-speed Transmission Gears

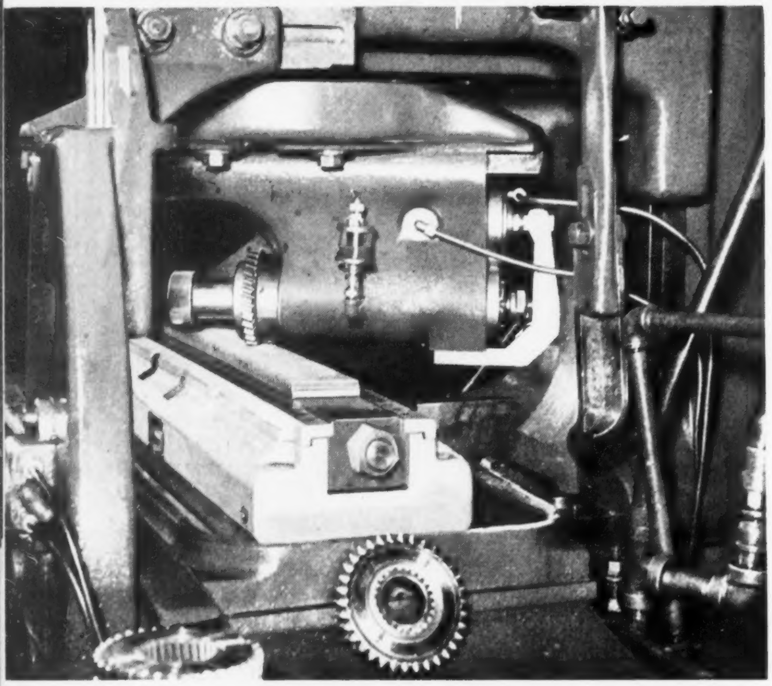
Engineering in the Buick Plant

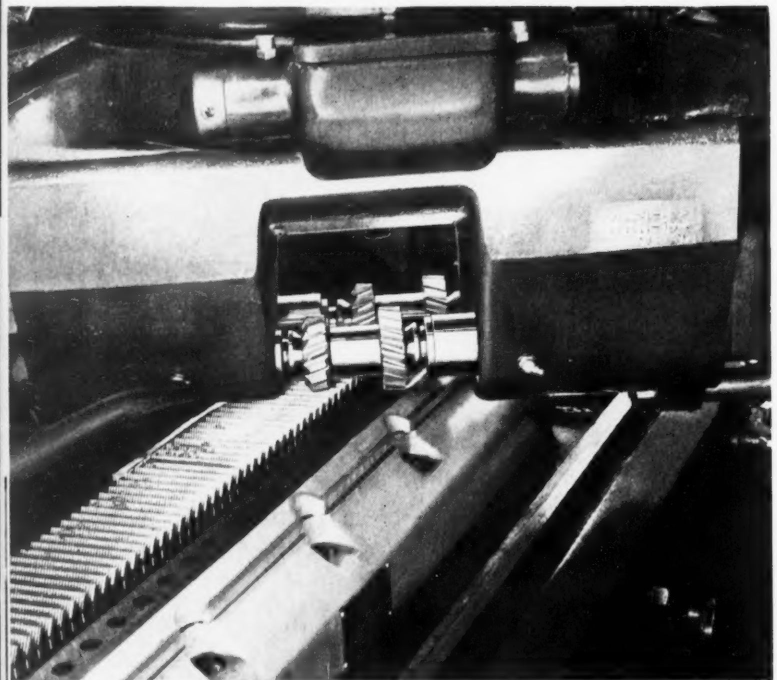
the stub arbor when air is admitted into the cylinder to actuate a yoke connected to the rear end of the bar on which the collar has been placed. Accuracy is insured not only by the seating of the broached hole in the gear on the stub arbor, but also by the location of the finished face of the gear against a shoulder on the arbor. With this method of handling the work, one man can operate two machines.

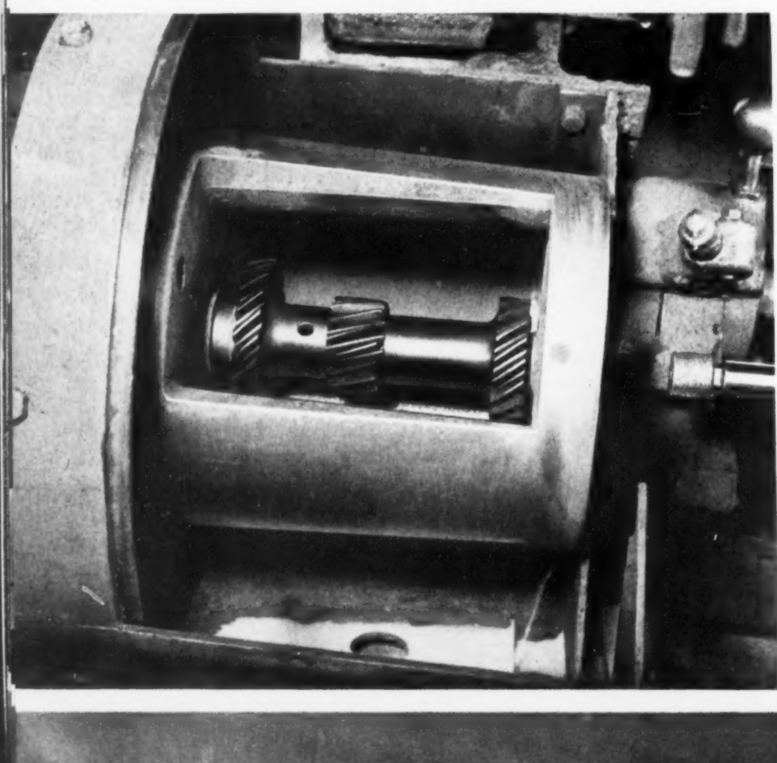
Another Michigan gear shaving machine equipped with a special work-head is illustrated in Fig. 3. This head is designed to enable two reverse idler gears to be shaved simultaneously. The two gears are loaded into the teeth of the shaving rack and positioned endwise against two live stub centers in the rear (stationary) end of the work-head. Then an air valve is operated to advance the two live stub centers into the front end of both gears. The entire head is adjustable crosswise of the shaving rack to enable the work to be correctly positioned.

Tooling recently designed to insure the required accuracy in grinding opposite ends of the bore in the countershaft gear is shown in Figs. 4 and 5. The bores ground in this operation are about 1 1/8 inches in diameter and 1 1/4 inches long. Although the distance across the two surfaces is approximately 7 inches, the bores must be straight within 0.0005 inch and in true alignment within 0.001 inch. The diameter tolerance is also 0.001 inch. Previously, the two bored surfaces were ground with the part located from the teeth of the two gear sections at the ends of the part, and grinding wheels were applied from each end, but it was decided that the operation would be facilitated if the work could be located from centers.

A pot chuck with a hollow center at the right-hand end was designed for this purpose, as seen in Fig. 5. The hole through this center is large enough for the grinding wheel to pass through. At the left-hand end of the chuck is a solid center, which is advanced to or withdrawn from the work through the operation of a lever. The use of centers in the extreme ends of the work, which are







larger in diameter than the surfaces to be ground, insures accurate location of the part.

Both holes are ground in one set-up by a single wheel. Another advantage is that the use of a single wheel enables the operator to "spark out" the bores in finishing them to size, and the wheel can be withdrawn without any contact against the finished surfaces, if desired. The headstock spindle can be run at various speeds. Another feature, which was provided at the suggestion of the machine operator, is a cam that enables the pot chuck to be rotated freely by hand into the loading position. By the use of this equipment, one man can grind seventy-five gears an hour, operating two machines.

Unusual tooling developed for boring and threading the conical bronze bushing of synchronizing drums is illustrated in Fig. 6. In this operation, which is performed in a three-station Ex-Cell-O machine, a modified buttress thread with a lead of only 0.023 inch is cut across a surface 9/16 inch wide. Though the tools are fed through the work by hydraulic action, the error across these threads is very slight, and they are sufficiently accurate for the function that the drums serve.

The work-pieces are located on the hydraulic chucks from involute surfaces on two internal projections that may be seen on the parts lying at the right end of the tool carriage. They are gripped by clamps that pull against these projections. The chuck spindles are positioned at an angle of 7 degrees 55 minutes, so as to bring the conical surfaces to be machined into line with the movement of the tool carriage. Each of the stations on the tool carriage is equipped with two tools, one for boring and one for single-point threading.

In operation, the tool carriage feeds to the left for boring all three parts simultaneously, then moves slightly toward the front of the machine to relieve the cutters from the work, returns to the right, indexes forward to bring the second tool of each group into line with the work, again feeds to the left for threading the work-pieces, moves

Fig. 2. (Top) Gear Shaving Machine with Special Work-head Designed to Eliminate the Necessity of Mounting Flat Gears on Arbors

Fig. 3. (Center) Another Gear Shaving Machine with a Special Work-head that Enables Two Gears to be Shaved Simultaneously

Fig. 4. (Bottom) Equipment for Grinding Bores of Countershaft Clutch Gears while Held between the Centers of a Special Chuck

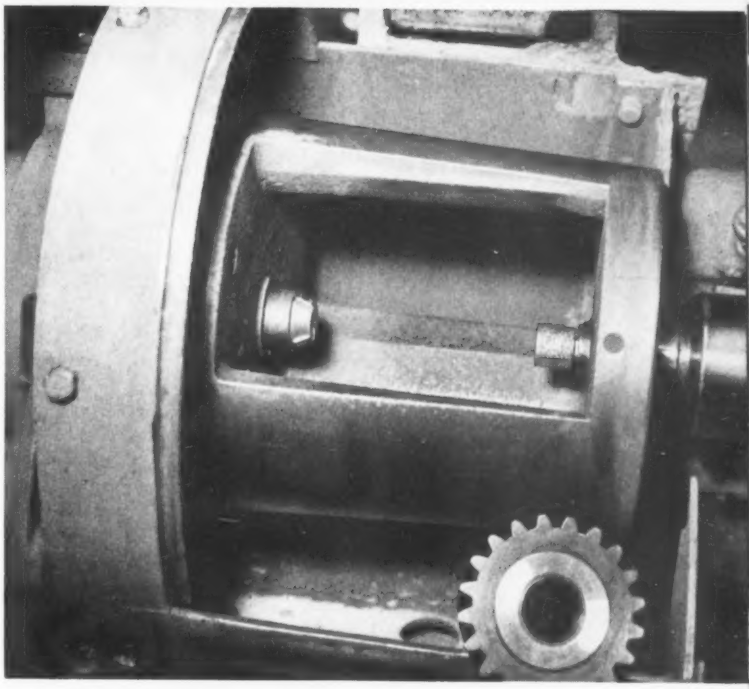
slightly forward to relieve the threading tools, traverses to the right for withdrawing these tools, and indexes the tools back to the starting position.

Attached to the front of each tool-block are arms that carry hardened cylindrical plugs which are swung upward for locating the boring and threading tools when they are replaced. It is the practice to employ feeler gages between these plugs and the tools. The plugs can be adjusted sidewise on their holders to suit larger or smaller work diameters, and the tool-blocks can be turned toward or away from the setting plugs by loosening clamps and turning the graduated heads of screws. Tungsten-carbide tools are employed in this operation.

Transmission main shafts 21 inches long are turned from 1 3/8-inch bar stock in the Conomatic illustrated in Fig. 7, which was especially designed to enable the machine to operate continuously, without stopping as each new bar of stock is fed. Without this provision, much idle machine time would occur. The bar stock is 12 feet 8 inches long, which leaves only 5 inches of waste material on each bar.

To avoid frequent stopping, the feed mechanism was designed to advance the stock 5 inches more than is required for each transmission main shaft. Thus, when a new bar is being fed, the 5-inch waste piece from the previous bar drops into the pan of the machine and the new bar continues to move forward until it reaches the stop. In feeding the same bar forward for subsequent pieces, the stock advances until it reaches the stop, after which the feeding device slides idly along the stock.

As each transmission shaft reaches the cutting-off position, a hollow spindle, which may be seen in Fig. 7, advances over the shaft from the right-hand end to provide a support and also to carry away the cut-off part. The hollow spindle is equipped with a head having fingers which engage a groove in the transmission shaft so as to pull the shaft with it when the spindle withdraws to the right. When the spindle moves to the left for supporting the next piece of work, this shaft pushes



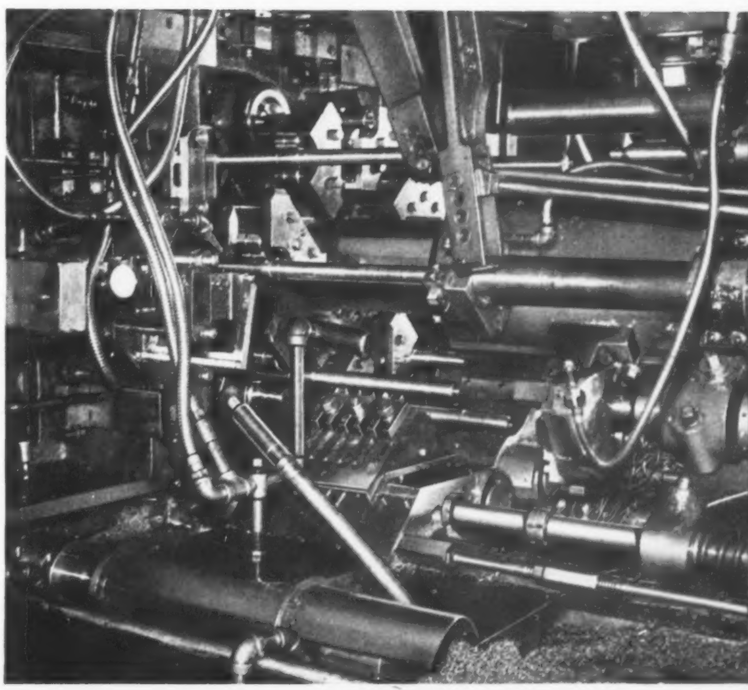


Fig. 5. (Top) Pot Chuck in Fig. 4 Shown Unloaded to Illustrate Method of Feeding the Grinding Wheel through the Hollow Center

Fig. 6. (Center) Tooling Provided for Boring and Threading a Tapered Surface in Three Synchronizing Drums in One Operation

Fig. 7. (Bottom) Large Automatic Screw Machine Arranged for Feeding New Bars of Stock without Stopping the Machine

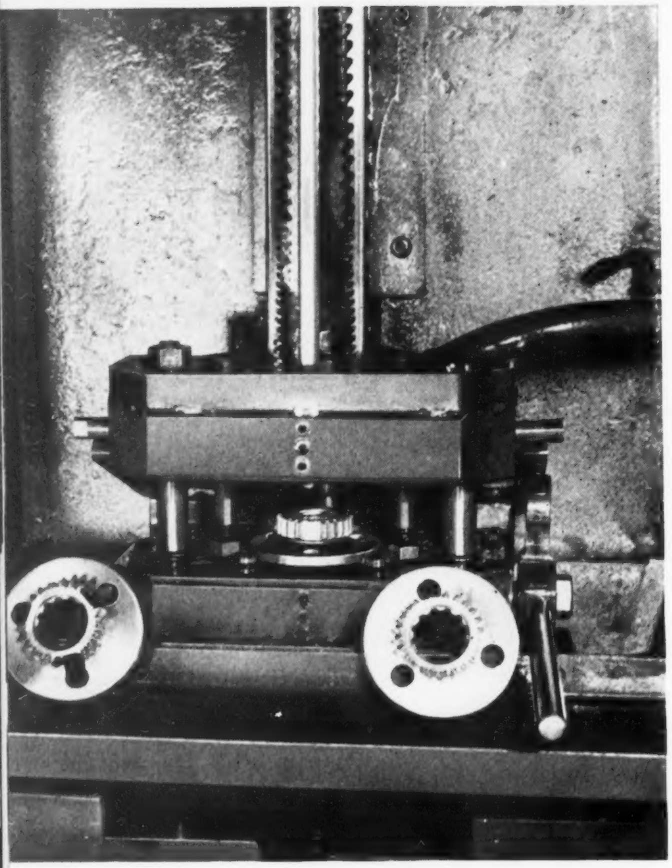


Fig. 8. Work-fixture and Broaches Developed for Cutting Three Slots in Accurate Relation to Spaces between Clutch Teeth

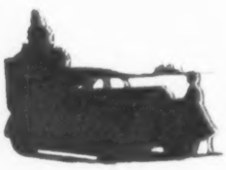
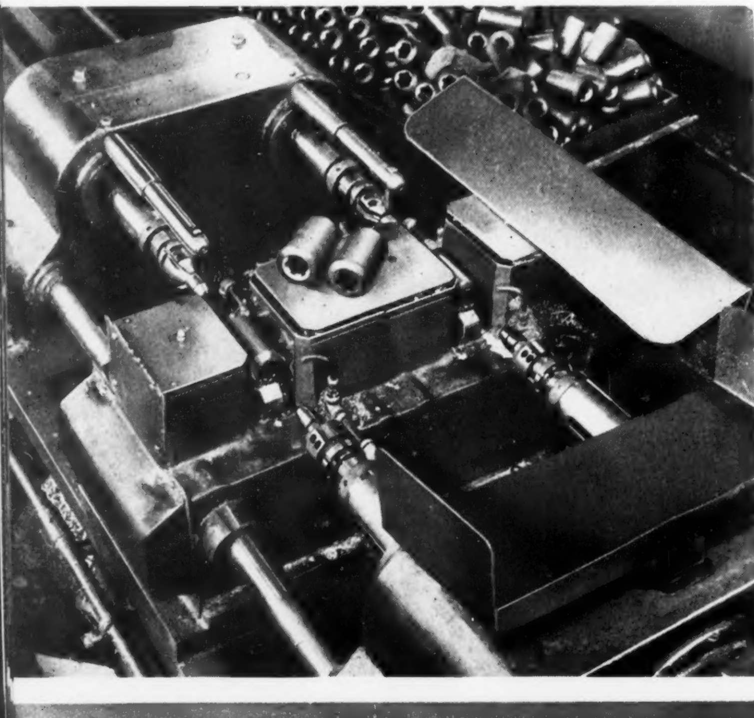


Fig. 9. Machine that Chamfers Both Ends of Two Transmission Sliding Sleeves in Accurate Relation to Splined Bores



the previous one farther through the hollow spindle. Each piece is eventually pushed out of the head end of the machine.

Several lengths are turned on the shaft in this operation, as well as three grooves, and the shaft is centered at one end. Rollers that are held under a tension support the shaft in all stations of the machine, with the result that the "run out" on any shaft is never more than 0.002 inch. The grooves must be correctly spaced within 0.002 inch, and only from 0.012 to 0.017 inch of stock is left on the shaft at both ends for the subsequent grinding operation. Tantalum-carbide tools are used for the roughing cuts, and Stellite J-Metal for finishing. Forty shafts are produced per hour.

The second-and-third speed clutch has three holes in the flange, as seen in the example at the front of the machine in Fig. 8, which are broached on one side square with the spaces provided between the clutch teeth, as shown by the example at the left. The broached slots are 17/32 inch wide. This operation is performed simultaneously on all three holes by the use of an Oilgear vertical hydraulic broaching machine provided with the equipment illustrated. The holes are drilled and reamed before the clutches reach this machine. The part is located from the teeth, and is clamped securely on the flange when the upper part of the fixture is lowered on the base through the operation of the lever seen at the right.

Broaching occurs on the down stroke, the operation being performed on the push principle. The flat backs of the broaches are guided and supported during cutting by half-round bushings, projections on which engage V-grooves on the sides of the broaches. This prevents the broaches from dangling and striking any of the teeth on the work. The broaches are guided both above and below the work.

At the bottom end of the ram stroke, the broaches are automatically disconnected from the ram. In the meantime, the operator has raised a device in the bottom of the machine which connects with a circular groove at the lower end of the broaches for pulling them completely through the work. When the finished pieces have been unloaded, the operator employs this device to raise the broaches until they are again automatically connected with the ram for the up stroke.

From this broaching operation, the second-and-third speed clutches are transferred to the machine shown in Fig. 10, which simultaneously countersinks the three holes. An unusual device on the fixture insures stripping of the work from the tools at the end of the operation. When the tool-head is raised, a roller on each side runs along a cam-lever, the lower end of which is connected to a hori-

zontal slide. As the rollers reach the high points of the cam-levers, their respective slides are pushed horizontally over the top of the flange on the work and thus prevent the piece from rising with the tools. Springs normally hold the stripping slides in the withdrawn positions illustrated. Bushings provided for the pilots on the countersinks also serve as locators for the slots previously broached in the flanged holes.

A special Krueger machine developed for simultaneously chamfering the opposite end of two second-and-third speed sliding sleeves is shown in Fig. 9. This operation is performed just after the internal helical splines have been broached. The sleeves are placed, as shown, in V-blocks at the front and back of a fixture located between two hydraulically actuated tool-heads. As loaded, the center of each sleeve is slightly below the center of the corresponding tool-spindles, and one end of the sleeve is located against a vertical shoulder on its respective V-block.

When the tool-heads advance, taper pilots on the tool-spindles enter the splined hole in the work-pieces and raise them to the center of the tools. At the same time, a finger on each rear tool-head pushes the work-pieces firmly against the locating lugs on the V-blocks. Then, hydraulically actuated jaws on the work-fixture operate crosswise to grip the work-pieces for the chamfering operation, which occurs as the tool-heads advance at a reduced rate of feed. Each tool pilot is provided with a needle-bearing roller, due to the fact that the pilot must stand still in the stationary piece while the tool-spindle revolves. One man tends both this machine and the spline broaching machine, and obtains a production of 180 pieces an hour from both.

The operation shown in Fig. 11 illustrates an instance where manufacturing economies were effected, even though the production requirements were comparatively small. This was accomplished by equipping the machine for drilling and tapping two holes in different planes on four different parts. Each part is passed twice around the machine, once for machining one hole and a second time for the other hole, so that, in effect, eight different parts are actually handled.

The fixture is designed to accommodate first-speed and reverse, and second- and third-speed shifter shoes and selector levers. A 5/8-inch hole is drilled, reamed, and countersunk in each of the four pieces, after which a 3/8-inch lock-screw hole is drilled in each part at right angles to the previous hole and also reamed, countersunk, and tapped. Two work-pieces are loaded in each station of the fixture, and there are eight fixtures of four different types. One lever clamps both pieces.

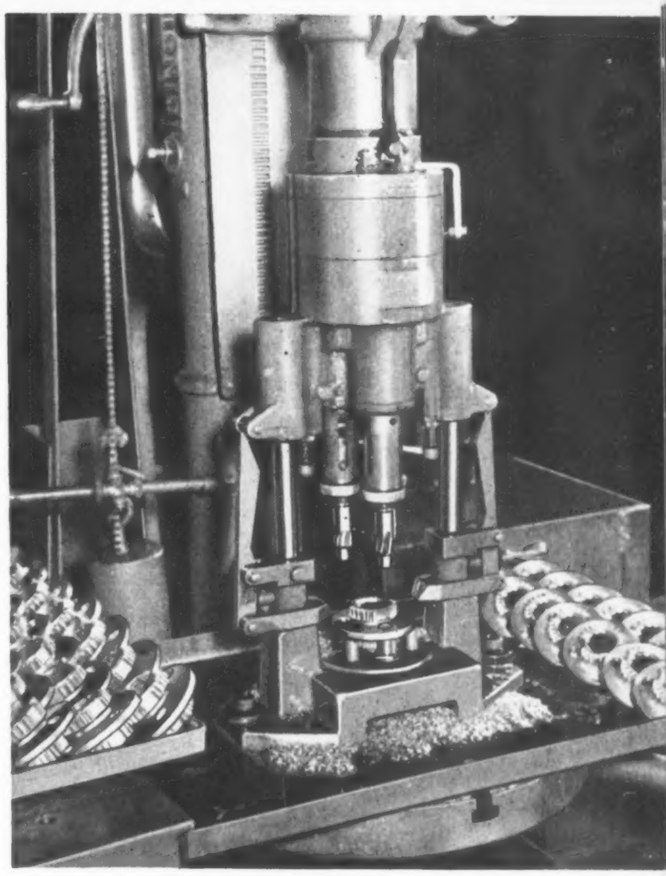
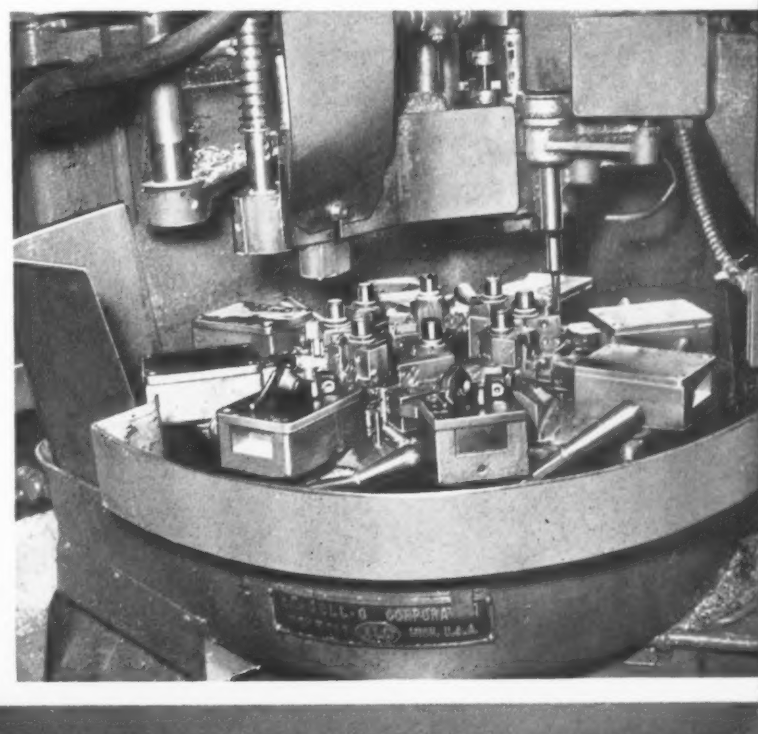
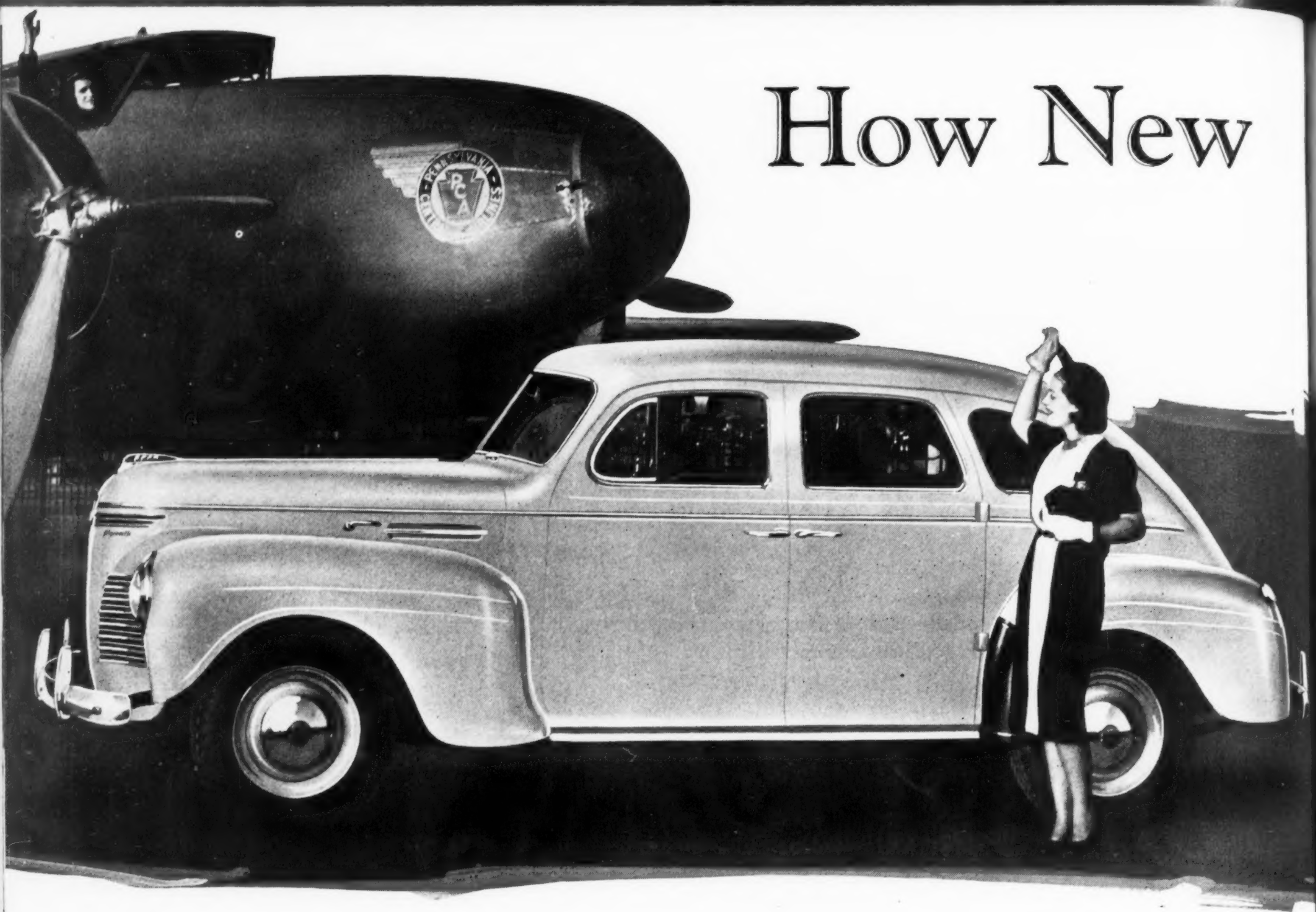


Fig. 10. Fixture Employed in a Countersinking Operation, which is Equipped with Slides to Strip the Work from the Tools

Fig. 11. Special Tool-heads and Fixtures Designed for Handling Eight Different Parts Required in Comparatively Small Quantities



How New



THE entire automotive industry recognizes the importance of thoroughly cleansing both the inside and outside of automobile cylinder blocks, cylinder heads, and manifolds of any possible metal chips, sand, particles from abrasive wheels, or other dirty substances. Scored cylinders will result from metal chips falling out of a cylinder head or an intake manifold during assembly. Similarly, bearings are likely to be scored by chips or particles of sand that may come out of a dirty oil gallery.

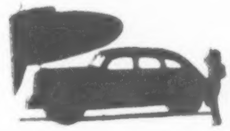
It is relatively easy to remove all grease and dirt from the outside of engine castings, but considerable trouble is generally experienced in cleaning the inside walls. This problem has been intensified in recent years by the close manufacturing tolerances necessary in building high-compression engines. The process of cleaning castings has recently been substantially improved by the Plymouth Division of the Chrysler Corporation, Detroit, Mich., through the installation of batteries of washing machines of the types here illustrated. These machines are designed to direct hot soda water at a high pressure over every square inch of internal surface in the castings, as well as over the outside surfaces. In the case of cylinder blocks, this is followed by blasts of air, which are also directed against all internal areas.

Four of these washing machines are installed in the cylinder-block production line shown in Fig. 1 to receive the blocks as they leave the final machining operation. The illustration shows the operators loading two of the washers, while blocks are being cleaned in the other two units. After the operator slides a cylinder block on the carriage of one of the washers, he steps on a foot-pedal to start the automatic cycle of the equipment.

The piston of an air cylinder at the rear of the unit then pulls the loaded carriage into the housing of the washer and locates it accurately in line with the nozzles of two rotating and several stationary spraying elements. A "gate" of nozzles at the door end of the washer automatically swings into position for directing sprays of soda water and air against the end of the casting that faces the door. Fig. 2 shows a cylinder block located in the washing machine, a side panel having been removed from the unit at the time the photograph was taken to show the interior.

The rotating spraying elements consist of two tubes that extend the full length of the crankshaft and camshaft bearings. These tubes are provided

Plymouth Washers Clean Engine Castings



with nozzles, located in predetermined positions to insure the delivery of the hot soda water into every hole or other opening in the cylinder block. The arrangement of the rotating and stationary spraying elements can be seen in Fig. 3, which shows a view of the interior of the washer from the front, the door being raised.

When a cylinder block has been brought into the washing position by the carriage, the door of the housing is automatically closed through the operation of a pneumatic piston. As the door is closed, a limit switch is tripped, starting the drive of the rotating elements and opening a valve that releases the hot soda water at a pressure of 100 pounds per square inch through the nozzles of the rotating and stationary spraying elements. Both rotating elements then revolve through 360 degrees during which their nozzles and those of the stationary elements outside the cylinder block discharge the soda water into each oil gallery, drilled or tapped hole, valve seat, and water-jacket opening. Upon the completion of one revolution of the rotating elements, the valve automatically shuts off the supply of soda water.

Another valve in a line that supplies air pressure at 100 pounds per square inch then opens up, delivering a blast through all nozzles of the stationary and rotating elements as the latter again revolve through 360 degrees. This step in the operation blows out any remaining chips or dirt, as well as any soda water adhering to the casting, and eliminates the hand operation of blowing out the interior of the engine castings. When the rotary elements have completed this revolution, the air valve is automatically closed, the washer door opens up, and the pneumatic cylinder returns the carriage and the cleaned cylinder block to a position in front of the washer for unloading.

Fig. 1. Four Cylinder-block Washers Designed with Rotating and Stationary Spraying Elements to Insure Complete Cleansing of the Castings Both on the Inside and Outside

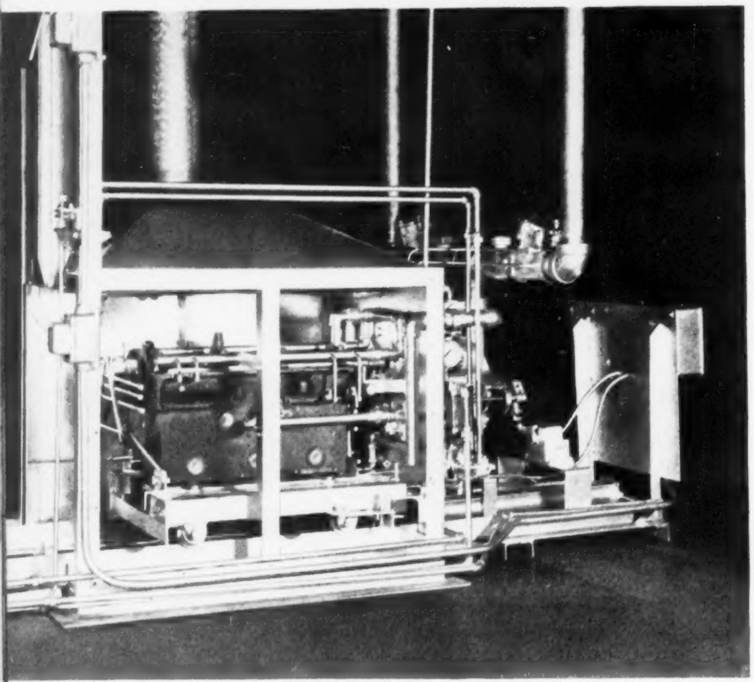
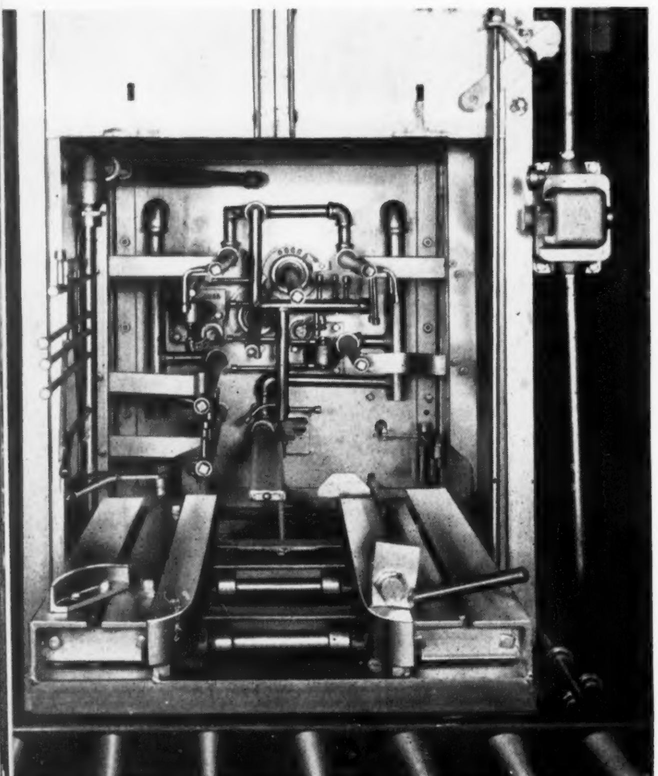


Fig. 2. Cylinder-block Washing Machine with Side Panel Removed to Show a Block and the Carriage in the Washing Position

Fig. 3. View of the Cylinder-block Washing Machine from the Front, Showing the Rotary Spraying Elements which Revolve in the Camshaft and Crankshaft Bearings, as well as the Various Stationary Elements



HOW NEW PLYMOUTH WASHERS

One row of nozzles in the rotating elements discharges the hot soda water or the high-pressure air at a slight angle in one direction, and another row at a similar angle in the opposite direction. Because these nozzle elements are revolved, every corner and nook in the interior of the cylinder blocks is thoroughly cleansed of all dirt and grease. The nozzles of the stationary elements are located to score "direct hits" of soda water or air. All together, there are approximately 400 nozzles in one of the cylinder-block washers, each of which is so located as to direct soda water and air against a predetermined area of the casting. The soda water is maintained at a temperature of 180 degrees F.

The nozzles are made with different venturi throats to meet individual needs. For example, a nozzle intended for cleaning a long oil gallery hole is designed to emit a long piercing stream of hot soda water or air blast that does not spend itself until it reaches the far end of the hole, while a nozzle directed toward a valve seat is designed to diverge so as to cover more area.

The equipment seen at the right end of the washer in Fig. 2 drives the rotary spraying elements and controls the automatic operation of the door, work carriage, and water and air valves.

Cylinder heads are handled by a washer constructed with a revolving drum or cradle that indexes through a complete circle around a horizontal axis. There are four stations on this cradle for handling four cylinder heads at a time, and the drum turns through 90 degrees at each indexing. The purpose of turning the cylinder heads over in the washing operations is to sluice out core sand and metal chips that would tend to lodge in the ribs of the water jacket if the heads were washed in a stationary position.

Each cylinder head is loaded in the bottom station of the cradle, being pushed into position by the operator, as illustrated in Fig. 4, and is held in the cradle by angle-iron brackets. The operator causes the cradle to index as each station is reloaded, by pressing a push-button. The cylinder head is subjected to four washings of ten seconds each as it moves from one indexed position to the next, by nozzles which revolve with the cradle. These nozzles discharge hot soda water, at a pressure of about 100 pounds per square inch, into each water-jacket hole in the cylinder head. In this washer, there are spraying elements having a total of approximately 200 nozzles.

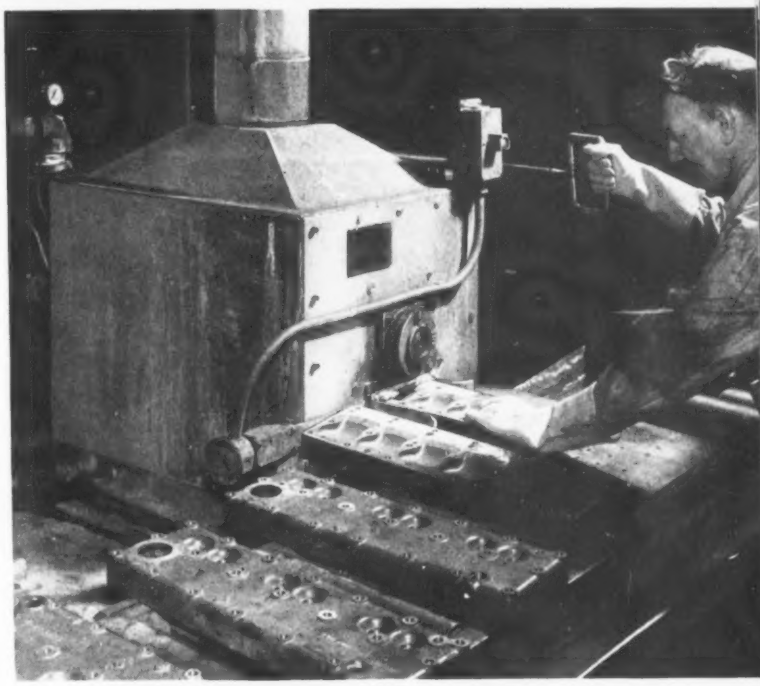
After each quarter turn, the cradle stops automatically and the operator unloads the washed cylinder head, which has reached the bottom position of the cradle. He pulls forward the long lever seen at the right-hand side of the washer in Fig. 4 to partially eject the washed cylinder head from the

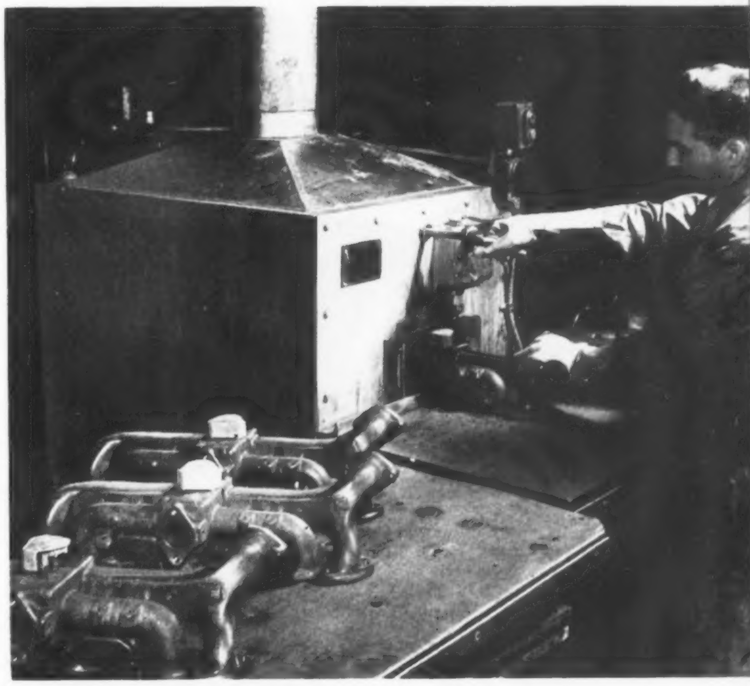
cradle, and then takes hold of the front end of the cylinder head to complete unloading. The operator next loads another cylinder head into the washer and presses the push-button to move the cradle through another quarter turn. The intermittent washing and draining of the cylinder heads has proved most efficient.

Intake and exhaust manifold assemblies are also handled by a washer of the indexing type. In these washers, however, the manifolds are loaded into the top station of the indexing cradle, as will be seen in Fig. 6, which shows a manifold washer in actual operation with one of the side panels removed to give a view of the interior. Each manifold assembly receives four washings of ten seconds each as the cradle indexes in four steps through 360 degrees. During each quarter turn of the cradle, nozzles that roll with the cradle discharge hot soda water to clean the inside of the manifold assembly. There are also stationary spraying elements.

The cleaning element for the intake manifold consists of four clusters of nozzles which discharge into the intake opening and into the three ports. These nozzles operate alternately in groups of two so as to give a reverse washing action. During the first quarter turn of the cradle, two groups of nozzles discharge into one of the end ports and into the intake opening. Then, during the next quarter turn, the other two groups of nozzles discharge into the opposite end port and into the center port.

The element for cleaning the exhaust manifold consists of six clusters of nozzles which discharge into each of the six ports of this manifold. Nozzles are also directed against the external surfaces of both manifolds. The intermittent washing and draining, together with the fact that each manifold assembly drains in four different positions, causes all dirt to be sluiced out of the interior of the manifold assembly, which is also true of the cylinder-head washing operation.





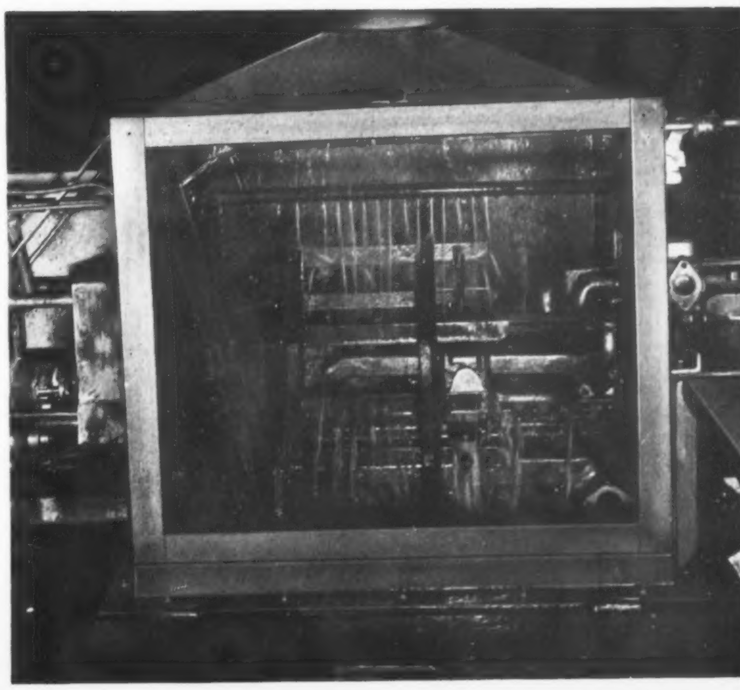


Fig. 4. (Top) Loading a Cylinder Head into the Cradle Type of Washer Used for Thorough Cleansing of These Castings

Fig. 5. (Center) Removing a Manifold Assembly from a Washing Machine that Completely Cleans These Assemblies

Fig. 6. (Bottom) Interior of an Intake and Exhaust Manifold Assembly Washer, Showing the Spraying Action on the Inside and Outside of the Castings

New Production Equipment

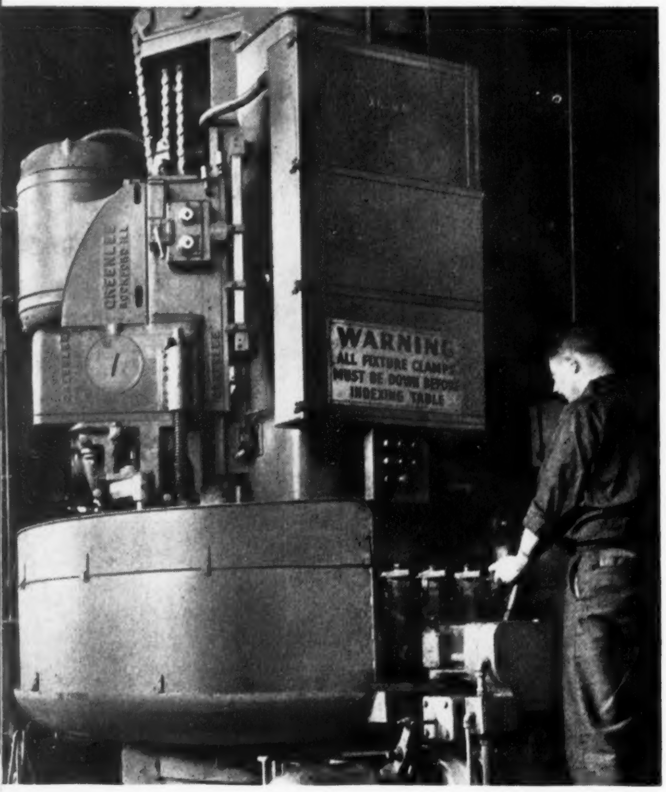
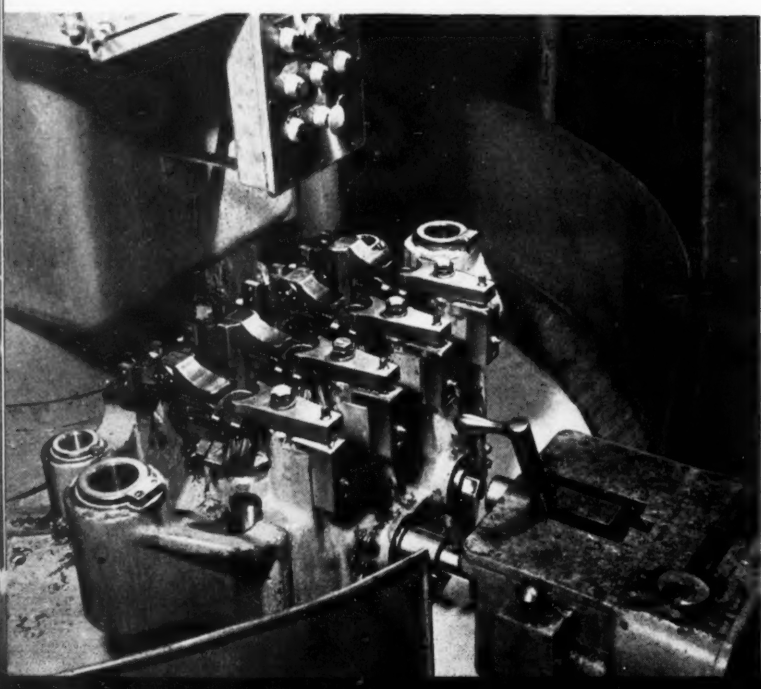


Fig. 1. One of Two Machines Recently Installed for Drilling, Reaming, Milling, and Sawing Connecting-rod Forgings

Fig. 2. Loading Station of the Machine in Fig. 1, Showing the Power-driven Wrench Unit for Clamping the Work in the Fixture and Releasing it at the End of the Operation



MASS production by methods previously unknown brought the automobile industry to its present magnitude because it made cars of high quality available at low cost; and if the industry is to continue to increase employment, constant advances must be made in manufacturing practices. The application of this principle has been an important factor in the growth of the Pontiac Motors Division of the General Motors Corporation, Pontiac, Mich. Following out this principle, the Pontiac Division has installed during recent months considerable new equipment that embodies many progressive ideas along the lines of tool engineering. Some of the outstanding machines are described here.

Machines of the type shown in Fig. 1 have been installed for performing preliminary operations on connecting-rods. When the rods are placed in this machine, they are integral with their caps, the practice of forging the rods and caps in one piece being followed in this plant in order to obtain the caps at a negligible forging cost. When the rods leave the machine, the crankpin ends have been core-drilled and milled on the bolt bosses, the wrist-pin ends drilled and reamed, and the caps sawn from the rods. Three stations are provided on this machine, one for loading and two working stations.

From the close-up view of the loading station in Fig. 2, it will be seen that four rods are accommodated by each of the three indexing fixtures. After the forgings have been loaded into a fixture, they are clamped by power-driven socket wrenches actuated by a drive at the front of the machine. These wrenches are engaged with square-end shafts that project from the front of the fixture by pushing forward a lever that can be moved around the U-slot seen in the illustration. When the lever is at the bottom of this slot, neither wrench is engaged with the fixture shafts; but when the lever is pushed to the top of either leg of the slot, the corresponding wrench is slipped over a fixture shaft. Power is then applied for driving the wrench by turning the handle at the top of the lever in one direction. When the handle is turned in the opposite direction, the rotation of the wrench is reversed and the clamping pressure released from the work-pieces.

When the wrenches are driven in the forward direction, equalizing clamps are drawn tightly down on each connecting-rod to grip the crankpin end at two points and also to grip both sides of the wrist-pin boss. The clamps are operated by ver-

for 1940 Pontiacs

tical screws in the fixture, which are driven from the wrench-shafts through worm-wheels.

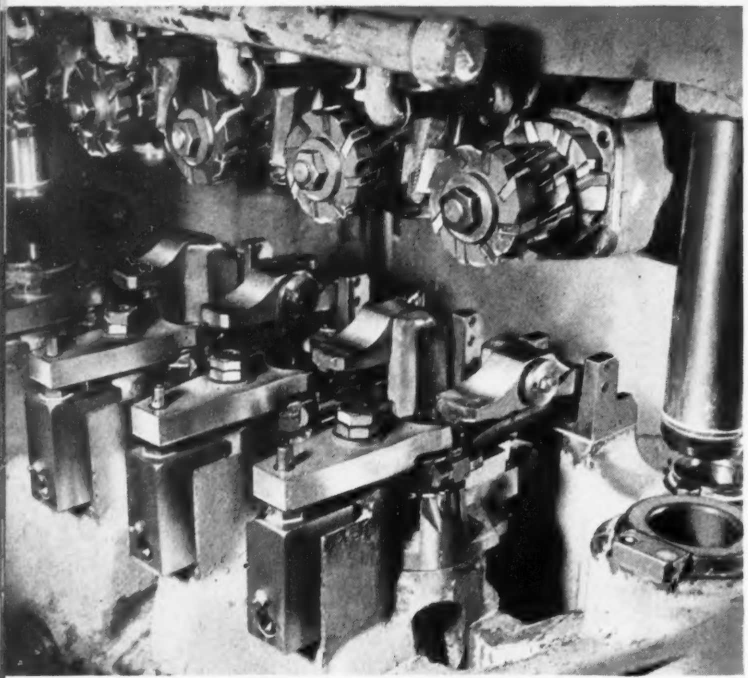
The fixtures are indexed from the loading station around the column of the machine toward the left. The first working station, which is shown in Fig. 3, is provided with a vertically operated tool-head, equipped with four inserted-blade core drills for rough-machining the crankpin bearings of the rods, four conventional drills for drilling the wrist-pin ends, and five horizontal arbors on each of which cutters are mounted for straddle-milling the top, bottom, and sides of the bolt lugs on the crank-pin ends.

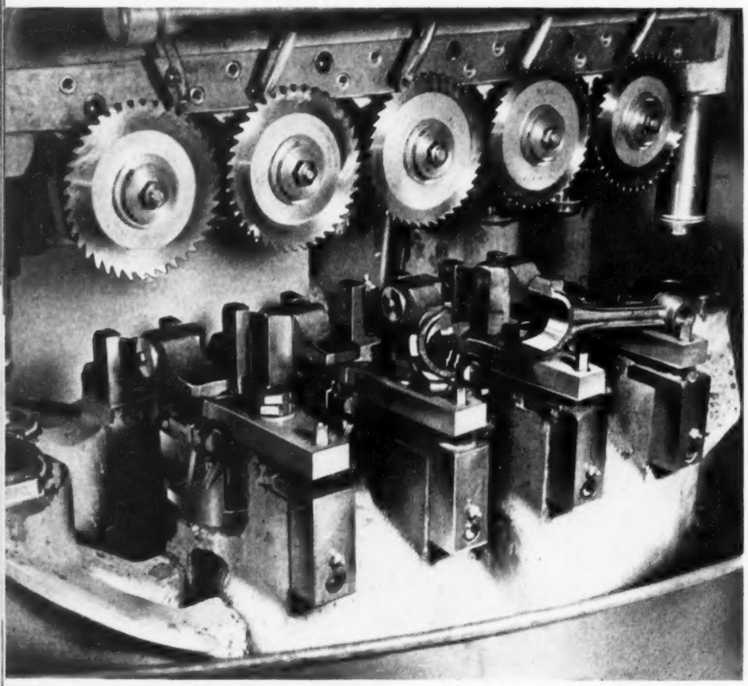
From the illustration, it will be seen that the crankpin ends of the connecting-rods are supported on hollow blocks that permit the core drills to pass through the work. Generous openings provide for ready disposal of the chips. Heavy pilot-bars on the tool-head engage bushed holes in the ends of the fixture to insure accurate location of the tools relative to the work-pieces. The production on this operation is 200 connecting-rods an hour.

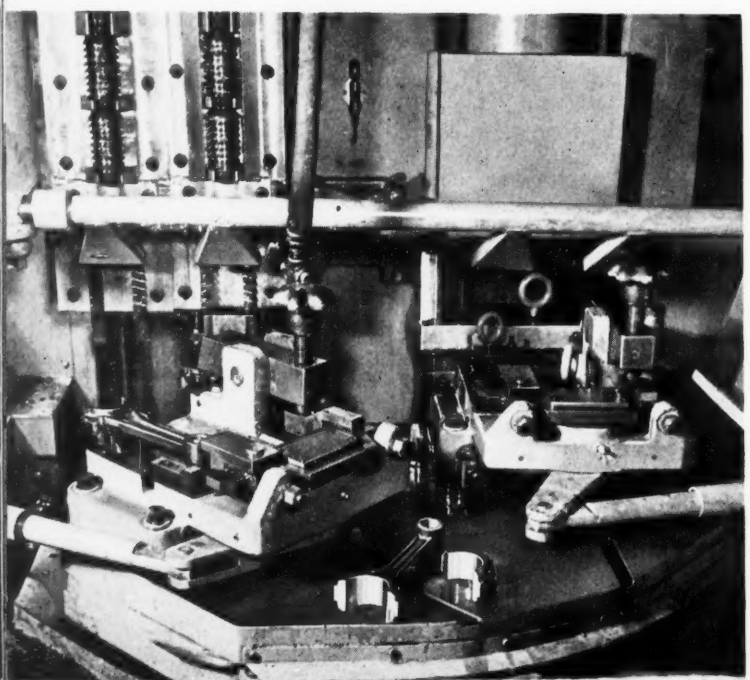
In the next station of the machine, which is shown in Fig. 4, five circular saws come down between the four connecting-rod forgings and cut the caps from the rods. At the same time, four reamers at the back of the tool-head machine the wrist-pin bores of the rods. The saws are 6 inches in diameter and 0.135 inch thick. The cut-off caps, as well as the rods, are held firmly by the clamps until the fixtures are indexed into the loading position. The two tool-heads of this machine, as well as the wrench unit, are equipped with independent motor drives. Both the tool-heads and the table are operated hydraulically.

The dual-ram hydraulically operated vertical broaching machine shown in Fig. 5 is employed for broaching the contact faces or parting line on both the connecting-rods and caps, and also the crankpin bearing surface and the sides of the bolt bosses. Identical cuts are taken on both sides of the machine, each fixture being designed to hold one rod and one cap at a time. The connecting-rod is located from the reamed wrist-pin hole and the previously milled under side of the bolt bosses, while the cap is also located from the milled bolt-boss surfaces.

At the beginning of the operation, two broach sections about 7 inches long rough-broach the contact faces on the rod and cap, and these are followed by ten semicircular sections about 4 inches long which broach the crankpin bearing surface. Along the sides of the last one of these semicircular sections are straight broach sections, also about 4 inches long, which machine the sides of the bolt bosses. Finally, at the top end of each broach is a flat section, about 4 inches long, that takes a shaving cut on each contact face, making these surfaces







flat within 0.001 inch. The production is 240 rods and caps per hour. Two machines of this type have been installed in the connecting-rod line.

Various drilling, reaming, counterboring, and other operations on the rods and caps are performed in a machine of the construction shown in Fig. 6, which is provided with four groups of tool-spindles on each end. The tool-spindles are fed hydraulically to and from the work-fixture with each indexing of the fixture. Three connecting-rods and three caps are held in each of the six fixtures of the work-drum. The connecting-rods are located at one end by seating the reamed wrist-pin holes on hardened and ground plugs, and at the other end from previously machined surfaces. The caps are located somewhat similarly to the crankpin ends of the rods. After the rods and caps have been loaded into the fixture, they are gripped securely through the application of a motor-driven wrench to a screw on the fixture, which actuates sliding clamps.

In the first working station, at the bottom of the machine, twelve spindles at the left drill a bolt hole half way through each rod and cap. At the same time, six spindles on a head at the right advance and bore away stock from the tops of the bolt bosses on the caps, so as to provide flat surfaces for the drills to break through in the next station of the machine. Otherwise an intermittent surface would exist that would tend to break the drills. At the same time, three additional spindles on the right-hand head spot-face a surface of small diameter on the wrist-pin end of the rods.

In the next station of the machine, tools on a left-hand head complete the drilling of the bolt holes started in the preceding station, and at the same time tools on a right-hand head rough-drill a small center in the wrist-pin bosses of the rods. When the rods and caps reach the third working station, the tool-head seen at the bottom left in Fig. 6 advances six milling cutters to machine bearing lock-slots in the rods and caps, and at the same

Fig. 3. (Top) Tooling for Drilling the Crankpin and Wrist-pin Holes and Straddle-milling the Crankpin End of the Connecting-rods

Fig. 4. (Center) Circular Saws Cut the Caps from the Connecting-rods while the Wrist-pin Ends are being Reamed

Fig. 5. (Bottom) Connecting-rods and Caps are Broached on the Contact Faces, in the Crankpin Bearing, and on the Sides of the Bolt Lugs

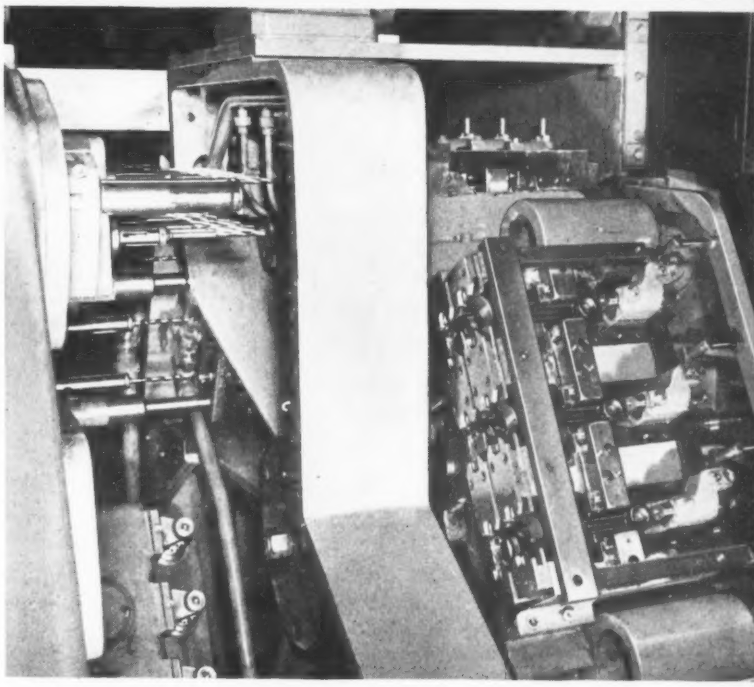
time, tools on a right-hand head chamfer the bolt holes in the rods and caps.

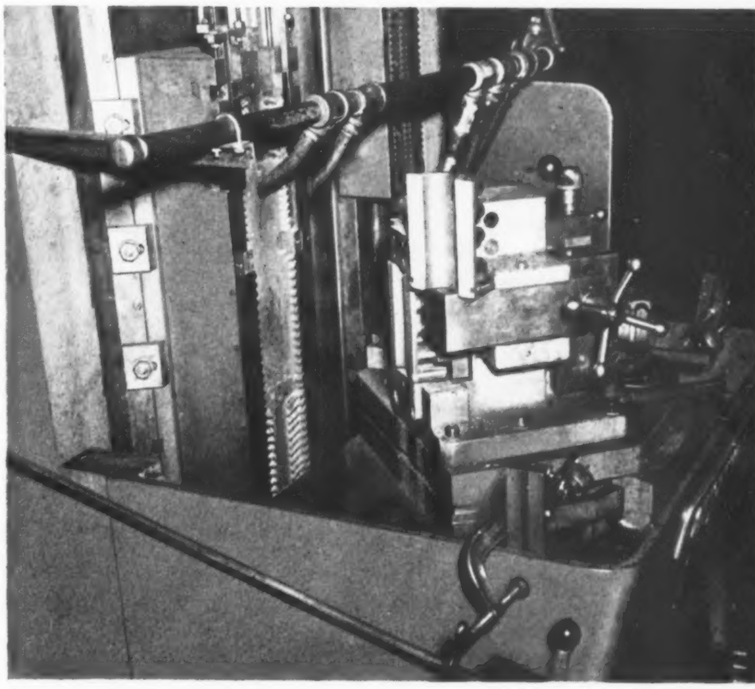
In the fourth working station, tools on a left-hand head drill a center hole in the crankpin bearing of each rod, while tools on a right-hand head finish-drill the center hole in the wrist-pin boss and counterbore the bolt holes in the caps. In the fifth working station, all bolt holes are reamed in the caps and rods by tools on the left-hand head seen at the top of the machine in the illustration. The fixtures are accurately located in each of the indexed positions by a heavy plunger that enters a pilot hole in the fixture casting.

When the connecting-rods are completely machined, they must be of the specified weight within 1/16 ounce. This inspection is performed on a double-end scale that weighs both ends of the rod at the same time. The necessary corrections are made by a machine equipped with inserted-blade hollow-mills that take cuts around both ends of the wrist-pin boss and with straddle-mills that remove stock from the top of the cap.

Crankshaft bearing caps are cast and machined in one piece at the Pontiac plant in order to reduce handling and eliminate a considerable number of time-consuming operations. The first operation on these castings is performed by the dual-ram hydraulic broaching machine shown in Figs. 7 and 8, which is equipped with fixtures that swivel automatically into line with the broaches prior to each downward movement of the ram and into the loading position before each return stroke, the operation being similar to that of the machine in Fig. 5.

The castings are first loaded, one at a time, into the left-hand fixture, as seen in Fig. 7, for broaching the long contact faces and the narrow flat edges that extend the full length of the casting at right angles to the contact faces. The castings are then transferred to the right-hand fixture, shown in Fig. 8, which is equipped with two stations, into which the castings are successively loaded. While in the right-hand station, seen in the foreground,





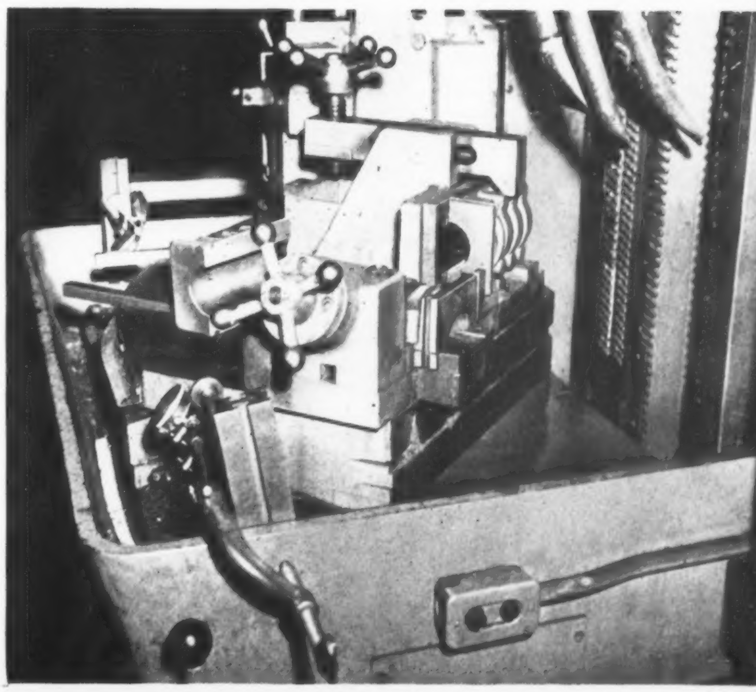


Fig. 6. (Top) Rotary Machine that Performs Drilling, Counterboring, Milling, and Reaming Operations on Connecting-rods and Caps

Fig. 7. (Center) Broaching Machine Equipped for Operations on Main Bearing Caps, which are Cast in One Piece for an Entire Engine Block

Fig. 8. (Bottom) Two-piston Fixture Provided on the Right-hand Side of the Machine in Fig. 7 for Broaching Three Surfaces

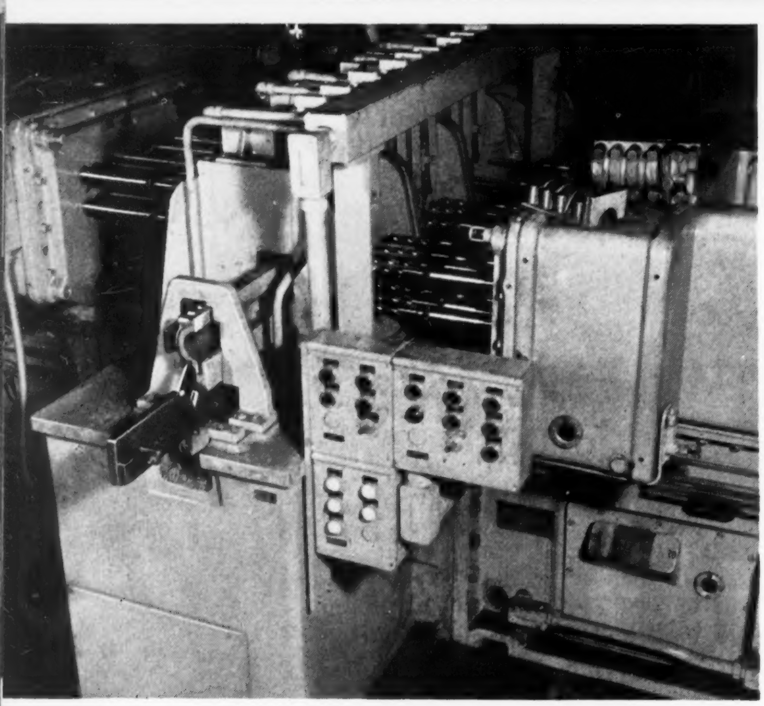
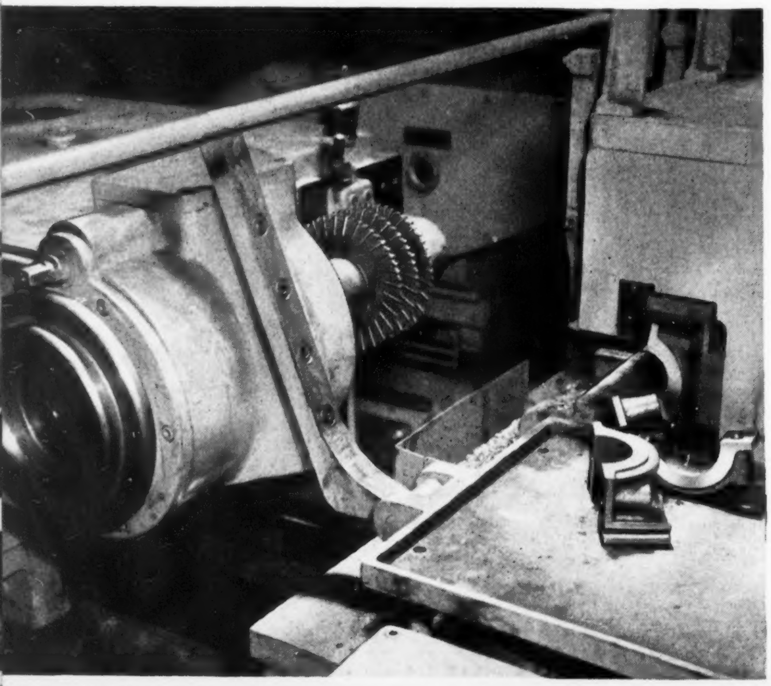


Fig. 9. Starting End of a Machine which Performs Drilling, Spot-facing, Reaming, Tapping, and Milling Operations on Bearing Caps

narrow grooves are broached down the sides of the casting at right angles to the contact faces. Then, when the casting is transferred to the left-hand station, which is in the background in Fig. 8, broaching is performed on the narrow edge that extends across the top of the casting at one end, parallel to the contact faces. Two broaches are provided on the ram of this station to suit castings for either six- or eight-cylinder engines, but only one broach is used at a time. The production is 120 castings per hour.

Fig. 10. Finishing End of the Machine Shown in Fig. 9 from which the Individual Caps are Discharged



An unusual machine employed for the remaining operations on the bearing caps is illustrated in Figs. 9 and 10. The castings are loaded in the starting end of this machine between guide bars, as seen in Fig. 9, and are automatically carried to the various working stations of the machine by an intermittently reciprocated bar that projects in front of the guide bars. The castings are accurately located in each working station by an overhead V-block plunger that is lowered on one bolt boss. The shuttle bar is air-operated, and is cushioned by a hydraulic cylinder.

In the first station, a battery of drills mounted in a head on the right-hand side of the machine drills one-half the bolt holes in the casting; this machine is completely tooled to handle castings for either six- or eight-cylinder engines. When the castings are indexed to the next station, the remaining holes are drilled by a second battery of drills on the right-hand head, and at the same time a head at the left is advanced for spot-facing the tops of the bosses that were drilled in the first station. In the third station, tools mounted on the right-hand head ream two holes in the portion of the casting that is to form the rear bearing cap, while tools on the left-hand head spot-face the remaining bosses of the casting.

Several idle stations then occur along the guide bars to provide space for servicing the machine, after which the castings reach a station where cutters on a horizontal arbor of another tool-head are advanced for milling the lock-slots. The cutters are permanently mounted on this arbor, the arbors being changed to suit castings for six- and eight-cylinder engines. Four slots are milled in the castings for six-cylinder engines, and five slots in the castings for eight-cylinder engines.

After passing through several additional idle stations, the castings reach a station opposite the milling head seen in Fig. 10, which advances narrow slitting saws for cutting the caps apart. The castings are clamped in this station by horizontal plungers that are applied at several points, so that the separate caps will be held firmly until the slitting operation has been completed. The arbor of this slitting head is also changed to suit castings for six- and eight-cylinder engines. While the slots are being milled another head on the opposite side of the machine taps a hole in one cap of each group.

At the end of the slitting operation, the cut-off bearing caps are discharged from the guide bars of the machine on a tray, as seen in Fig. 10. This tray is tilted upward each time the slitting head advances for an operation, so as to provide room for the arbor housing. Similarly, the section of the conveyor track or guide bars is tilted upward

each time that the slotting head in the previous station feeds forward. All heads of the machine are hydraulically actuated. When the tray is tilted upward, the bearing caps cut off during the preceding movement of the slitting head slide off the tray and into a tote box.

The various clamps on this machine are tightened on the work by weights, and are released through an air-operated camshaft that extends the length of the machine. The machine is approximately 19 feet long, and produces 80 sets of bearing caps an hour.

Eight-spindle chucking automatics employed for roughing and finishing cast-iron pistons are shown in Figs. 11 and 12. In the roughing operation, the pistons are passed twice through the machine, the automatic being double-indexed for this purpose. For the first pass around the machine, the piston is mounted on a pin chuck, with the closed end extending toward the central tool-slide; and for the second pass, it is held in a collet chuck from the rough-turned closed end, with the skirt extending toward the central tool-slide.

In the first pass around the machine, the piston is rough-turned for one-half its length, starting from the closed end, by tools on the central slide in the lower front position of the machine; faced to length on both ends by tools on the lower rear slide, as seen in Fig. 11; and finished to length by tools on the upper rear slide. A center hole is also drilled in the closed end during the finish-facing by a drill mounted on the central slide.

In the second pass of the pistons through this roughing automatic, the remaining length is turned in the bottom position of the spindle-carrier; the open end is bored in the rear middle position of the machine; and the open end is reamed in the upper front position of the machine, all tools being mounted on the central slide. Tungsten-carbide tools and soluble oil are used in the roughing operation, and production is maintained at an average rate of 150 pistons an hour per machine.

The automatic employed for finishing the pistons is also arranged for double indexing; but in this case, the pistons pass around the machine only once, two sets of tools being provided, so that two pistons are finished with each indexing. The pistons are located on plug adapters in the reamed open end, and the outer closed ends are supported by spring-loaded air-operated live tailstock centers on an indexing carrier substituted for the conventional central tool-slide. This machine indexes over the top rather than around the bottom, as in the case of the roughing machine.

In the first two stations at the top of the machine, the pistons are finish-turned the full length by tools mounted on side slides at the front and rear of the machine. Then, in the two rear central positions, seen in Fig. 12, tools on a side slide are applied for finish-facing the pistons to length and cutting three ring grooves. Pistons in the bottom positions of the machine are finish-grooved by side-heads at the front and back. Mineral seal oil is used in this operation as a lubricant, with the result that the grooving tools last for an entire day, whereas they had to be changed every two hours when other coolant was used. All tools in the finishing operation are also tungsten-carbide tipped.

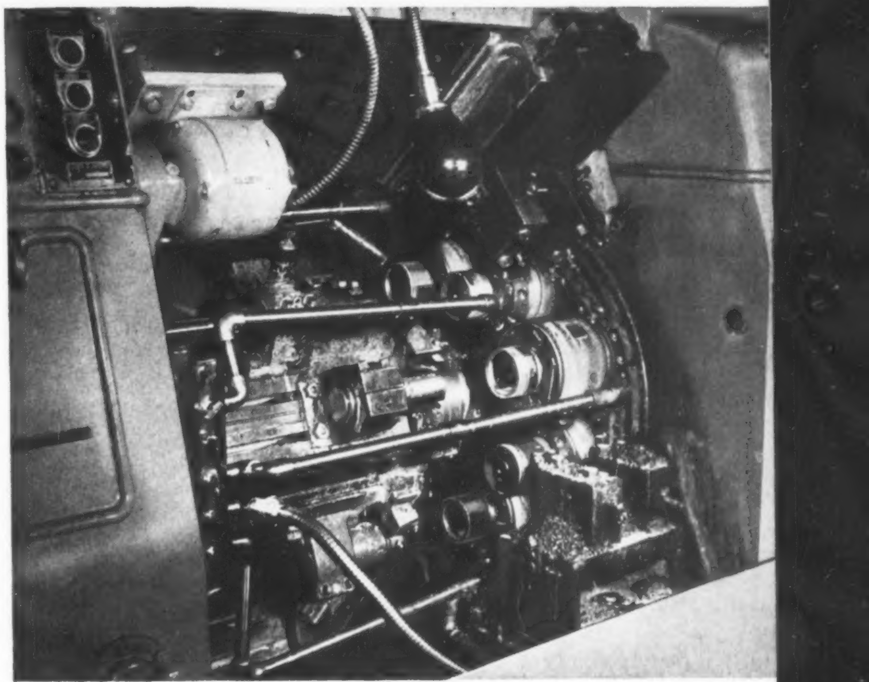
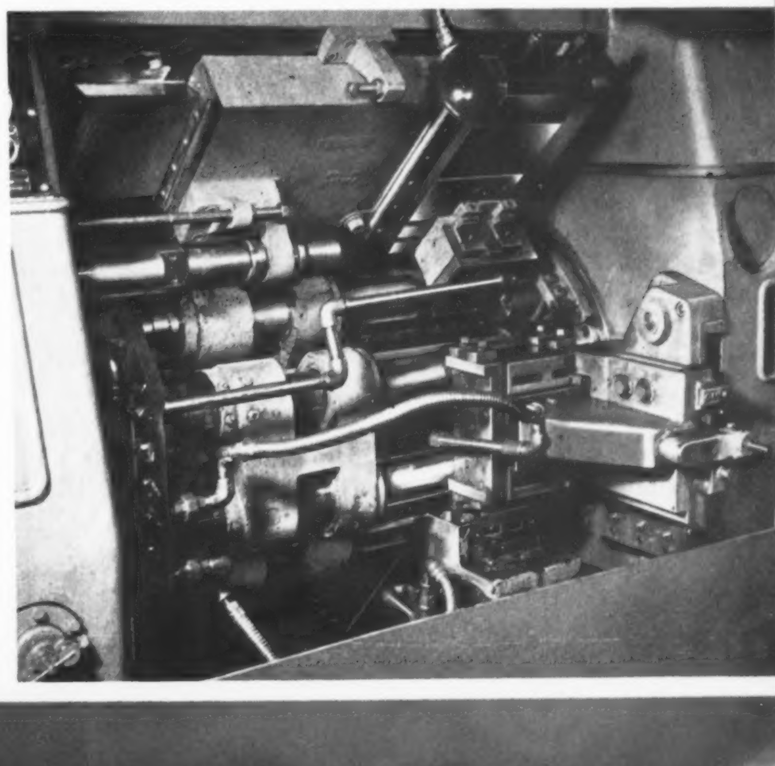


Fig. 11. Eight-spindle Automatic Set up for Roughing Pistons in Two Passes Through the Machine which is Double-indexed

Fig. 12. Automatic Employed for Finish-turning, Finish-facing and Cutting the Ring Grooves on the Pistons



Manufacturing Heaters

Fig. 1. Starting End of a Machine Line Installed in the DeSoto Plant for Manufacturing Heaters for the Air-control Systems of Chrysler Corpn. Automobiles

Fig. 2. Projection Welding Operation in which Three T-nuts are Attached Simultaneously to the Front Half of the Heater Housing

An all-weather air-control system which supplies clean, fresh air to car interiors, regardless of weather conditions, is now available for all types of automobiles built by the Chrysler Corporation. Fresh air is taken into the car through the cowl ventilator, where it is most free from dust and exhaust fumes, and is passed through filters that eliminate all dust particles and other solid matter. In winter, the air is heated to a comfortable temperature as it passes through hot-water radiators. The slight, positive air pressure created within the automobile prevents the infiltration of cold air or carbon monoxide gas through any crevices in the body. Drafts within the car are also eliminated by this positive pressure, as well as fogging and frosting of the car windows.

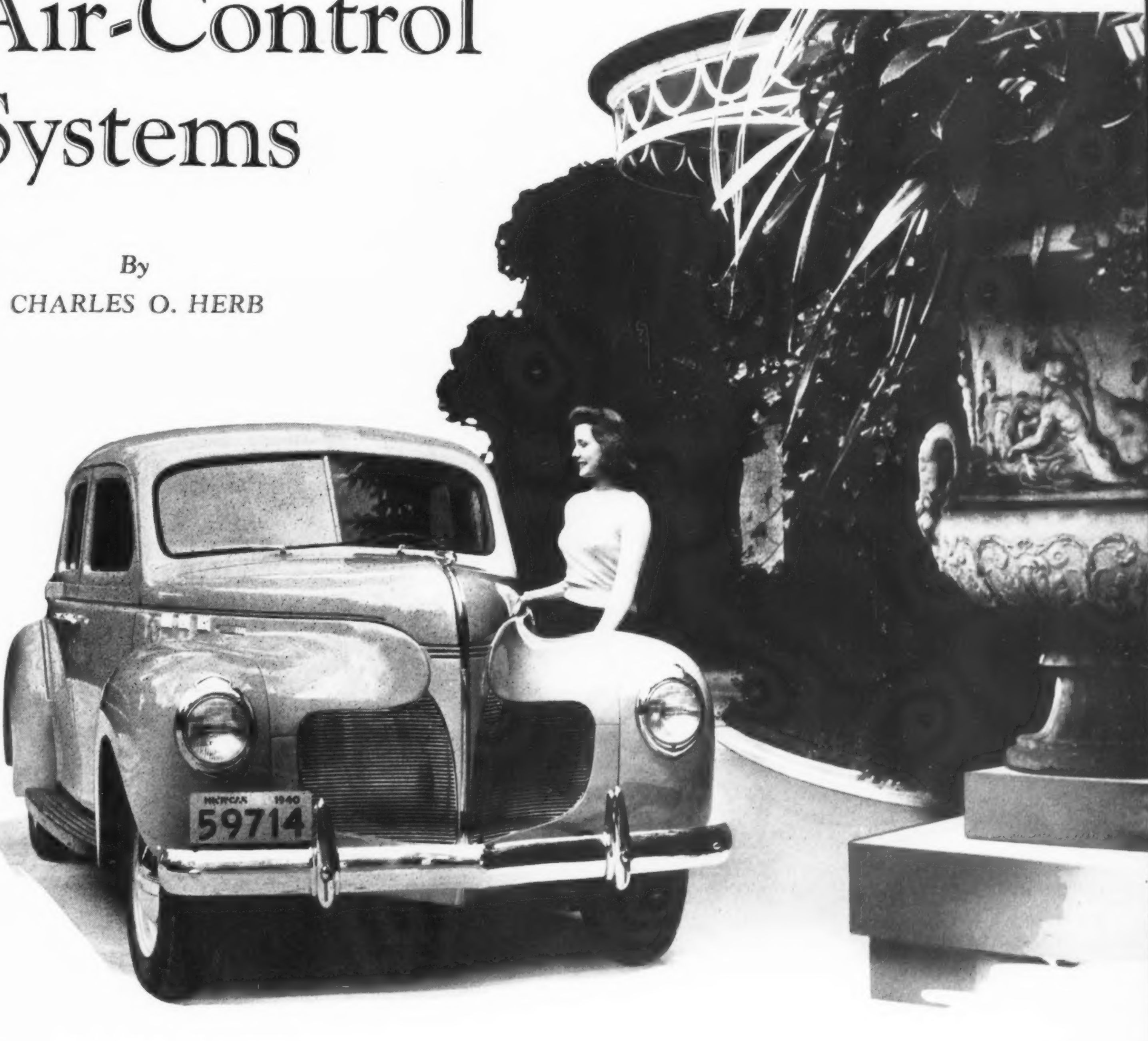
Air-control systems for the various Chrysler Corporation cars are manufactured by the DeSoto Division, which has recently established a department that is devoted exclusively to the production of these units. Some of the more important operations on the heater and blower units, with the exception of those involved in producing the stampings, are described in the following. This department is tooled up for producing two thousand heaters per eight-hour day.

Preliminary assembly operations on the heater stampings are performed by batteries of welding machines and power presses installed on each side of the 3-foot wide belt conveyor seen in Fig. 1. The first machine at the left is a projection welder having a rating of 100 kilovolt amperes. This machine, of which a close-up view is presented in Fig. 2, is employed to weld three T-nuts to the front half of the heater housing for attaching a motor bracket mounting. The T-nuts are slipped into sockets or bushings in the lower welding fixture, after which the heater stamping is located on the nuts by slipping two holes in the stamping over gage pins that are provided on the fixture. Each of the nuts is welded at two points on small projections that were previously formed on the stamping.

The next machine along the conveyor line is a spot-welder of 30 kilovolt ampere rating, which is used to attach a blower anchor plate and a small baffle plate to the inside of the back half of the heater housing. In this operation, which is shown in Fig. 3, two spot-welds are made on the anchor plate and one on the baffle plate. The anchor plate is seen being welded in the illustration. It is readily located by positioning it in a rectangular depression

for Chrysler Corporation Air-Control Systems

By
CHARLES O. HERB



that was formed in the stamping. Spot-welders of this type are employed for performing a number of similar operations on the heater housings.

Assembly of the two stampings that make up the main heater housing is accomplished by means of the power press operation illustrated in Fig. 4, which consists of clinching a flange on the front half of the housing tightly around a flange on the back half. The front half is nested in the die, which has a wall that fits the stamping snugly around its entire outside surface. The flange of the stamping seats on a flat surface that extends around the top of the die.

After this stamping has been loaded into the die, the hinged gate at the front is swung upward into the work to insure close seating of the flange around the die and provide a locating edge for the back half of the heater housing when it is placed on top of the front half. The gate is automatically locked in the closed position.

The back half of the housing, while being loaded into the machine, is held by a strap type device that encircles the stamping. When the machine is operated, an internal tapered edge that extends around the bottom of the punch gradually bends the vertical flange of the front half down on the flat flange of the back half. The two stampings are locked securely together as a flat surface on

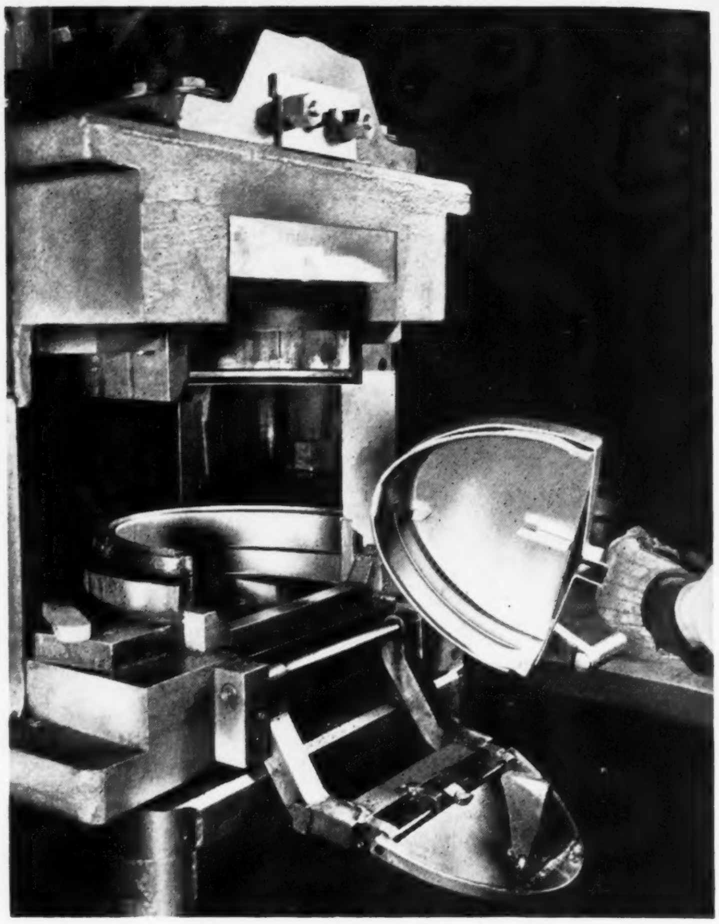


Fig. 3. One of a Series of Spot-welding Operations Performed on the Heater and Blower Unit Stampings

Fig. 4. Unique Power Press Operation, in which Flanges Extending around Heater Stampings are Clinched Together

Fig. 5. Spot-welding Operation, in which a Special Fixture Insures Careful Attachment of Mounting Brackets

Fig. 6. Punch and Die Equipment Provided on a Power Press for Cutting a Square Opening in the Curved Periphery

the inside of the punch closes the two flanges tightly against each other.

Sheet-metal mounting brackets are spot-welded to two sides of the heater housing in operations of the type shown in Fig. 5. To insure proper location of each bracket, the end of the housing is held firmly against two lugs that project from the vertical face of the fixture while the bracket is located by slipping a hole over a gage pin that also projects from the face of the fixture. After one weld has been made to attach the bracket to the housing, the operator releases the bracket from the locating pin and moves the housing toward the right along the face of the fixture, in order to make three or four additional welds. The method employed for locating the bracket completely eliminates the human element, so far as accuracy of the operation is concerned.

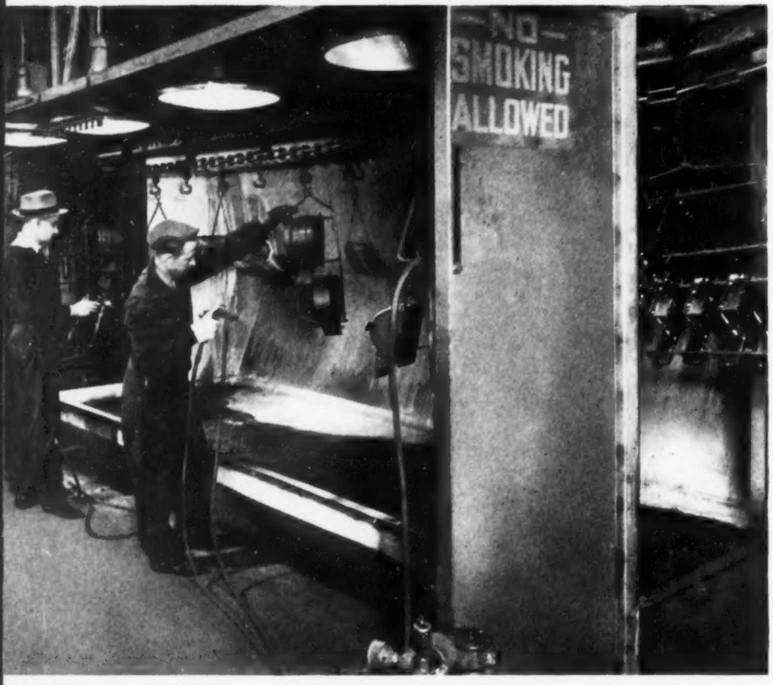
After both brackets have been spot-welded to the housing, the assembled unit is passed to the power press shown in Fig. 6 for piercing a square outlet hole in the curved periphery. The work is located in the bottom die from the top or open end, which is seated against angular blocks and is nested for sidewise location. The hole is sheared as a square punch descends through the large open end of the housing and forces the stamping against the shearing edges of the square hole in the bottom die. The scrap is ejected through this die opening. A spring operates a stripper plate to prevent the housing from adhering to the punch on the up stroke.

The two sides and shroud of the blower housing are assembled by a second clinching operation, as illustrated in Fig. 7. The sides are assembled loosely within the shroud, and the three pieces are then placed in the die, after which the operator slips a small square fixture into the outlet opening, so as to insure accuracy of this opening at the end of the operation. Next, the operator closes the swinging arm on the right-hand side of the die to lock the work-pieces securely in place and provide a supporting edge completely around the flanges to be clinched at the top and bottom of the shroud.

A feature of this operation is the provision for convenient loading and unloading of the work. The piston of an air cylinder at the rear of the machine is connected to a slide on which the die is mounted. Air is applied to push the die slide to the front of the machine as shown, for reloading the work, and also to pull the slide back beneath the ram to a stop for the performance of the operation. Safety devices prevent the operation of the ram except when the die is in the working position. Accurate location of the die is insured by pilot-pins on the punch-holder engaging bushed holes in the die-block and in the hinged arm.

Fig. 7. Another Clinching Operation, Employed for Assembling the Two Sides and Shroud of the Blower Housing

Fig. 8. In Spot-welding Together the Heater Housing and Blower Outlet, an Unusual Open Type Fixture is Used



MAKING CHRYSLER HEATERS

Fig. 9. (Top) The Complete Heater Housings are Sprayed with a Crackle-finish Paint after Passing through a Vapor-bath Washing Machine

Fig. 10. (Center) Upon the Return of the Heater Housings from the Drying Ovens, the Motor and Blower-wheel Units are Assembled

Fig. 11. (Bottom) The Final Step in the Production of the Heater Units Consists of Inspecting for Noise, Vibration, and Electrical Capacity

The main heater housing and the blower outlet are welded together by a spot-welding operation performed by the machine shown in Fig. 8, which is equipped with electrodes positioned at an angle so that otherwise inaccessible places can be reached. An ingenious fixture was devised to lock the two housings together in the desired relation, both radially and endwise. As will be seen in the illustration, the fixture is of an open design, which enables the electrodes to be readily applied wherever desired.

The assembled heater and blower housings are next hung on a conveyor which carries them to a washing machine, where they are thoroughly cleansed by a vapor bath, and then to the paint spray booth shown in Fig. 9. Paint is applied that leaves a crackle finish. The painted parts are then carried by the conveyor through a long oven, heated to 350 degrees F., the passage through the oven requiring approximately two hours.

When the housings have been completely dried, they reach the sub-assembly line shown in Fig. 10, where the blower wheels and motor assemblies are attached to them through the application of portable electric high-cycle screwdrivers and nut-setters. The assembled units are then carried by the belt conveyor to the inspection bench which is seen at the right in Fig. 11, where they are tested for quietness, vibration, motor voltage and amperage, and so on. Finally, the motor covers are assembled, and the units are ready for application to the automobiles.

Simply Constructed Electric Heating Bath

By R. W. WYMAN
Cleveland Electric Illuminating Co.
Cleveland, Ohio

THE Cleveland Tractor Co. uses many grease retainers on its various types of farm and industrial tractors. Each of these retainers has a leather washer to form a tight and lasting grease seal. Although the design of the grease retainers seemed satisfactory, they did not give the results expected. The trouble apparently was with the leather washers.

Upon investigating the matter, it was found that the shafts over which the retainers were fitted were not machined smooth, but had slight tool marks or ridges on them. The retainer washers were quite hard, and for that reason, were easily cut when they came in contact with the sharp ridges. To overcome this difficulty, it was decided to soak the washers in oil, so as to make them more pliable.

A small rectangular tank was made to be used as a soaking vat. The leather washers were placed in this. It was found that two days of soaking was necessary to produce a suitable leather washer. The results were satisfactory, but the process was too slow. The representative of the local power company suggested that if the washers were soaked in hot oil, the time could be greatly reduced.

Consequently, a new vat was built for an electrically heated oil bath. The tank previously used was retained for the oil bath proper, and the second tank was constructed 2 inches deeper and 4 inches wider and longer. Insulation was placed between the two tanks, and they were then welded together. A General Electric immersion heating unit was placed in the tank, and a thermostat employed for maintaining an even temperature.

By this simple means a heated oil bath was obtained which gave very satisfactory results. Properly treated washers could be produced in 2 1/2 hours. In fact, the washers treated in the heated bath served their purpose better than those that had been soaked in cold oil for two full days. There was not only a great saving in time, but one tank took care of the production for the entire plant; whereas with the previous procedure, additional tanks would have had to be built, or more storage space provided. A cover was used to minimize the heat loss, prevent oil fumes from rising, and keep the bath clean.

The electrically heated bath offered many advantages besides the saving of time, storage space, and cost of additional tanks. It presented no fire hazard, and no flues or ventilation was necessary for exhausting dangerous or disagreeable fumes.

Bridgeport Tools and Equipment Exhibition

AN exhibition of tools and equipment sponsored by the Bridgeport Tool Engineers' Association, Inc., was held at the State Armory in Bridgeport, Conn., from March 6 to 9. More than one million dollars worth of tools, machines, and accessory equipment was shown by 153 exhibitors from twenty-five states. Included in the exhibits were many types of cutting tools, machine attachments, control devices, inspection devices, electrical equipment, gages, and various metal-working machines.

Two technical sessions were held by the Society at the Stratfield Hotel in connection with the exhibition. The first was presided over by E. P. Gillane, of the Underwood Elliott Fisher Co., Bridgeport. The speakers were: William M. Duncan, of the Stuart Oil Co., Chicago, Ill., who spoke on "Cutting Fluids and Lubrication"; George H. Dennison, of the Carborundum Co., Detroit, Mich., whose subject was "Superfinishing"; and T. D. MacLafferty, of the Carboloy Co., Detroit, who discussed "The Current Trend in Cemented Carbide Development and Application." The second session was presided over by B. Merwin, of the Bullard Co., Bridgeport. The speakers at this session were: J. A. Comstock, of the Surface Combustion Corporation, Toledo, Ohio, who spoke on "Atmospheres for Hardening Steel"; H. W. Young, of the Charles A. Hones Co., Inc., Watertown, Conn., who discussed "Practical Tool Hardening Problems of the Small Manufacturers"; James Gill, of the Vanadium-Alloy Steel Co., Latrobe, Pa., who addressed the meeting on the subject "Application of Cutting Tools and High Speed Steel to Industry"; and E. P. Gillane, of the Underwood Elliott Fisher Co., Bridgeport, who spoke on "Controlled Tool Costs."

In an address at the opening of the exhibition, Governor Baldwin of Connecticut stated that new avenues of employment were being opened up by the conquering of industrial frontiers, as was well exemplified by the new products on exhibition. The exhibition was under the management of R. T. Phipps, purchasing agent of the Bullard Co., Bridgeport.

EDITORIAL COMMENT

Special Small Tools Increase the Cost of Manufacturing

Increased expense and inconvenience in manufacture, and especially in maintenance, is caused by the tendency of many designers to specify requirements that necessitate the use of special rather than standard tools in the building of machines. It is not unusual to find that numbers of threads are specified that are not standard. This necessitates that special taps be made, whereas if this were not done, the taps could be obtained directly from the standard stock of the manufacturers. Special taps cost several times as much to make as standard ones. The same holds true of other tools; even drills sometimes have to be made as "specials," to meet the ideas of the designer. In the case of T-slots, countersunk and counterbored holes, etc., it is always possible to so dimension these that standard tools can be used. A great saving in manufacturing costs can be made in this way.

Would the Senator Make Excavations with Tablespoons?

Senator Joseph C. O'Mahoney, of Wyoming, has introduced a bill in Congress which, as reported by the *Herald Tribune*, proposes to attack the unemployment problem by taxing employers who make "more than average" use of machine power, and paying a bonus to those who use a greater ratio of man power. Senator O'Mahoney is quoted as follows: "I believe that Congress, by a simple law, can create such an incentive to the private employment of labor as would put an end to our difficulties."

Why doesn't the Senator carry out his ideas consistently and propose a bill that would forbid the use of shovels for snow removal or excavation purposes and require tablespoons to be used instead? No greater incentive to increased employment of labor could possibly be conceived of. Think of the tens of thousands of additional men that would have to be employed to handle gravel and snow in that manner!

Perhaps it sounds silly to talk of the use of tablespoons for making an excavation for a twenty-story building; but it is no sillier than to propose to limit the use of efficient tools in industry for any purposes. The difference between a steam shovel and a hand shovel is just the same as the difference between a hand shovel and a tablespoon. There is no difference in principle, it is simply a difference in degree. The hand shovel is a better tool for excavating than a tablespoon, and a steam shovel is a better means than a hand shovel. If we want to serve the interests of labor, raise the standard of living, and keep the well-being of the people of the United States as much above that of the people of China as we have in the past, we will have to continue to use the efficient tools and methods that have raised the condition of our people above that of the Chinese people in the past.

Machines Produce More—Hence All Can Have More

Why is it that it seems so difficult for our public men to understand that the more easily those things can be produced that the great mass of our population requires for its comfort and well-being, the more comfort and well-being there will be; and, conversely, that the more difficult we make it for industry and labor to produce in abundance, the less everyone will have, and the more poverty and want there will be.

How Advertising Helps to Increase Employment

In recently published material, the Bureau of Research and Education of the Advertising Federation of America emphasizes how, given a worthwhile product, advertising has built many new industries, big and small. Through advertising, new products have been introduced to the buying public and old products have come into more general use, countless old industries having thus been expanded. This building of new industries and the expansion of old ones has, in turn, created a demand for raw materials and increased employment in many contributing industries. All of this has meant more employment, more wages. The whole economic life of the nation has been speeded up, the national purchasing power has been increased, and the economic well-being of the entire country has benefited. Thus advertising fills a very definite place in the national economic plan.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

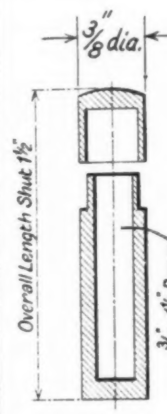


FIG. 1

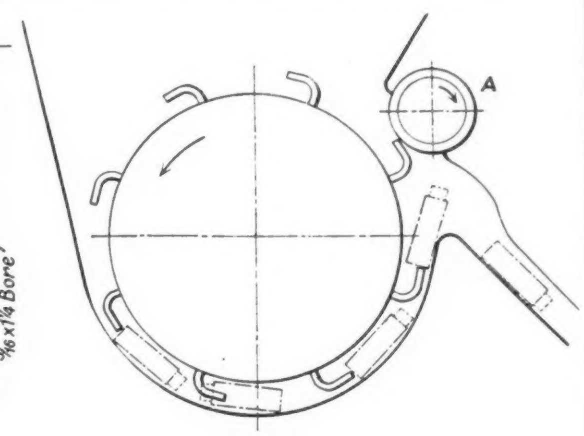


FIG. 2

Fig. 1. Molded Box for Holding Pencil Leads. Fig. 2. Mechanism for Feeding Boxes Open End Forward

Mechanisms Designed for Filling Containers and Applying Covers

The mechanisms here illustrated are employed in an automatic machine that places twelve pencil leads in a box and pushes the box cap in place. The box, or container, is molded by the injection process, the dimensions being indicated in Fig. 1. The selecting mechanism, shown in Fig. 2, takes the boxes from a hopper and presents them to the machine open end forward. The revolving disk carries hooks, so spaced as to allow a single box to be fed by each. If a box is in the wrong position, the hook enters its open end and retains it until the rubber-faced rotating roller *A* returns it to the hopper. Boxes fed correctly tip over into the delivery feed and slide toward the loading machine.

The continuous belt conveyor, shown in Fig. 3, has successive stations to which boxes, leads, and caps are brought in correct synchronism and quantities. Falling from the selector shown in Fig. 2, the boxes drop into a single-column, vertical stack, the lower end of which is open at the sides. This opening faces one side of the belt conveyor, Fig. 3, which carries properly spaced finger clips at regular intervals. An intermittent feed of the conveyor belt is obtained by means of a Geneva mechanism. The driver of the Geneva motion carries a face-cam that is set to impart a sharp blow to the lowest box in the stack during the stationary period of the belt, propelling the box into the spring clip on the belt. The belt then transports the box to the lead-filling station.

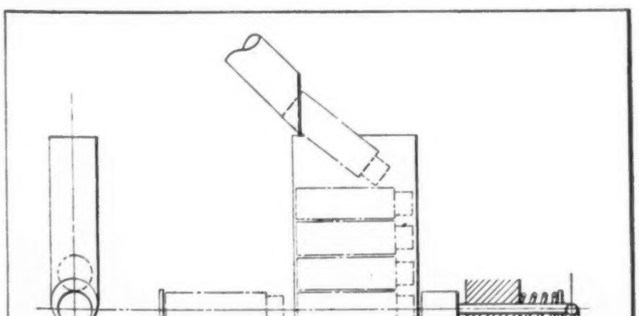


Fig. 3. Arrangement for Feeding Boxes Intermittently on Belt Conveyor

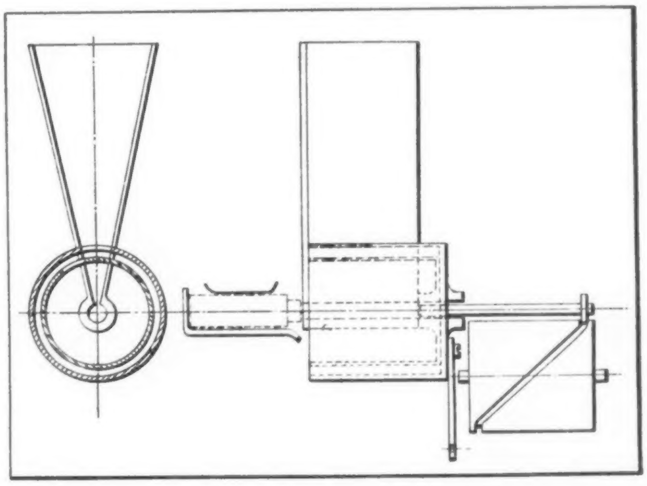


Fig. 4. Mechanism Employed to Select Correct Number of Pencil Leads and Feed them into Box

The lead-filling station, shown in Fig. 4, includes a counting and feeding mechanism. A circular shutter valve is employed to take twelve leads from the hopper. This valve contains only two rows between its shutters, which, in this case, are open-

ended hollow cylinders provided with suitable ports. Only a sector of the hollow cylinders is required for the counting operation, but complete cylinders are employed for the sake of simplicity and rigidity of construction. These cylinders are oscillated by the lever arm, the lower shutter opening as the upper one closes. No overlap is shown in the illustration, but a certain amount of overlap is necessary, and this is provided by increasing the stroke of the operating lever.

From the valve, a dozen leads fall into the guide chamber, which is bored rather smaller in diameter than the boxes to be fed. The boxes are carried along the belt until they register accurately with the guide chamber. When in this position, a constant accelerating drum type cam moves a plunger forward and backward, feeding a supply of leads into the box without shock.

The belt is next traversed to bring the box to the cap or cover station, where the cover is fed into position by a selector similar to the one used for the boxes. The "hand" of the selector must, however, be reversed, as the open end of the cover must be presented in a position opposite to that in which the boxes are fed to the conveyor belt. This station is shown in Fig. 6. The caps are fed down a tube, rolling out through an open incline into the single stack container which has open sides. The feeding mechanism is similar to the one used for the boxes, although a more gradually accelerated thrust is applied by the face-cam. The conveyor chain belt is kept at the proper tension to insure accurate register at the different stations. The belt passes a deflector which ejects the filled boxes.

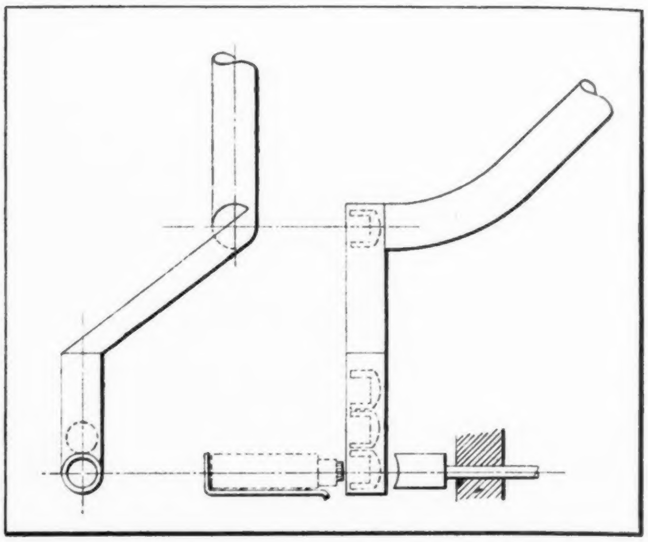


Fig. 6. Mechanism for Placing Covers on Filled Boxes

Before describing the alternative loading mechanism shown in Fig. 5, attention is called to a feature, without which much loss of time might be experienced in the high-speed automatic operation of the mechanisms described, namely evidence that the feeding mechanism has functioned properly in placing the required number of leads in the container. The simplest way to detect empty boxes is by weight; loaded holders or boxes, on rolling down a flexible shelf, fall sooner than the empty ones. A dividing line, correctly positioned, is therefore used to separate the filled and unfilled boxes, thus providing a simple means for this inspection.

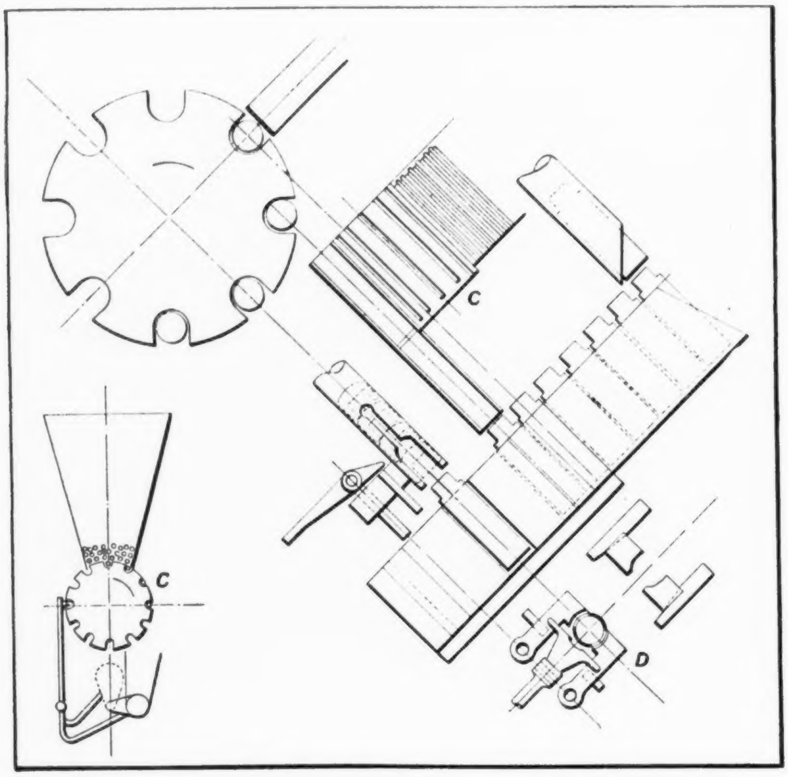


Fig. 5. Drum Type Mechanism Designed for Loading Pencil Leads into Boxes

In the alternative mechanism, the belt is replaced by an inclined revolving drum. The selected boxes fall into a single-column chute. When a slot in the drum reaches a position opposite the chute, one box drops into place and is carried around to the lead-filling station. The leads are also counted out by a revolving slotted drum *C*, two of the slots of which are extended beyond the others to operate the shutter movement that closes the inclined trough into which the leads fall from the drum.

At the capping station, selected caps slide down the supply tube, which has a spring arrangement designed to catch the lowest cap just before it reaches the exit. At the correct instant, the capping lever is rocked about its bearing, closing two jaws on the sides of the lowest cap while carrying it forward. A plan view of this mechanism is shown at *D* below the drum, cam-slides being provided to close the jaws during the forward movement. As the main drum revolves to the next position, the loaded boxes fall from their slots and again pass a mechanism that is arranged to detect unfilled boxes in the manner previously described.

Republic Steel Expands Facilities for Stainless Steel Production

Slitting Coils into Narrow Strip at the Stainless Steel Finishing Plant of the Republic Steel Corporation

THE Republic Steel Corporation formally put into operation improved and greatly expanded stainless steel manufacturing facilities at its plants in Canton and Massillon, Ohio, February 28. At Massillon, the stainless steel department now occupies a five-acre building. With the exception of the hot-rolling of coils, which is done at Warren, Ohio, the corporation has now concentrated all its stainless steel operations in its plants at Canton and Massillon. The expanded facilities have a stainless steel capacity in the strip department alone of 1200 tons a month. The new facilities will produce coils of cold-rolled stainless strip as narrow as 1/4 inch and as wide as 23 15/16 inches. The plant is also equipped to polish sheets 68 inches wide by 24 feet long. All the stainless steel made by the Republic Steel Corporation is sold under the trade name "Enduro."

At the present time, the largest single use for stainless steels is for automobile trim. It is estimated that probably one-third of all stainless steel produced today goes into the radiator grilles, hub caps, molding, gas tank caps, and miscellaneous automobile hardware. Hundreds of tons are used in steering-wheel spokes.

One of the new developments that, in all probability, will have a widespread effect in opening additional markets to stainless steel is the coloring of the metal. Although still in the development stage, clear bright colors which greatly enhance its natural beauty have been successfully applied to the metal. An example of this use of color is to be found in the escalators recently installed in the Pennsylvania Railroad Station in New York.

Cold-rolling Coils of Stainless Steel on the New 34-inch Reversing Mill in the Republic Steel Corporation's Expanded Stainless Steel Finishing Plant at Massillon, Ohio. The Steel is so Carefully Protected that Paper is Rolled into the Coils between the Steel Layers, as Shown at the Lower Left

Aluminum Research Laboratories Install Huge Testing Machine

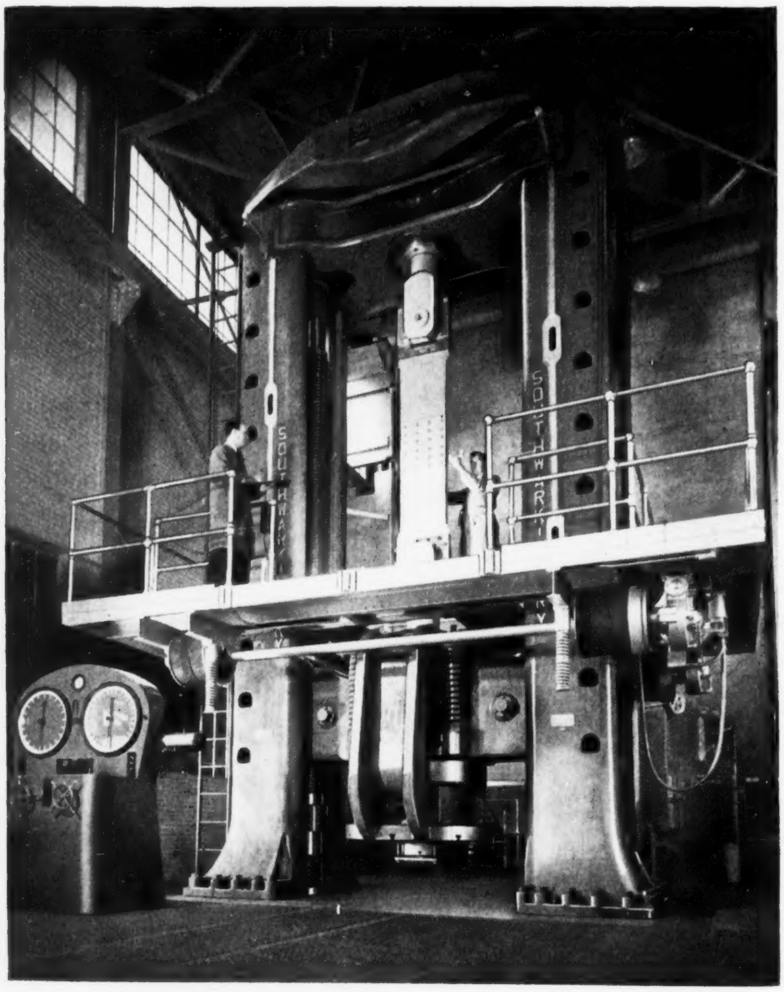
The Most Powerful Testing Machine in the World has Just been Installed at the Aluminum Research Laboratories in New Kensington, Pa.

A HUGE testing machine, called the Templin machine after R. L. Templin, chief engineer of tests of the Aluminum Co. of America, which is capable of exerting a force of 3,000,000 pounds in compression and 1,000,000 pounds in tension, has just been installed at the Research Laboratories of the Aluminum Co. of America in New Kensington, Pa. While this is not the largest machine of its kind, it is the most powerful, since it exerts the forces mentioned at speeds up to 36 inches a minute—faster than any similar testing machine; and since power equals force times speed, the claim made for the machine as the most powerful is justified. This new testing machine was built by the Baldwin-Southwark Corporation, Philadelphia, Pa.

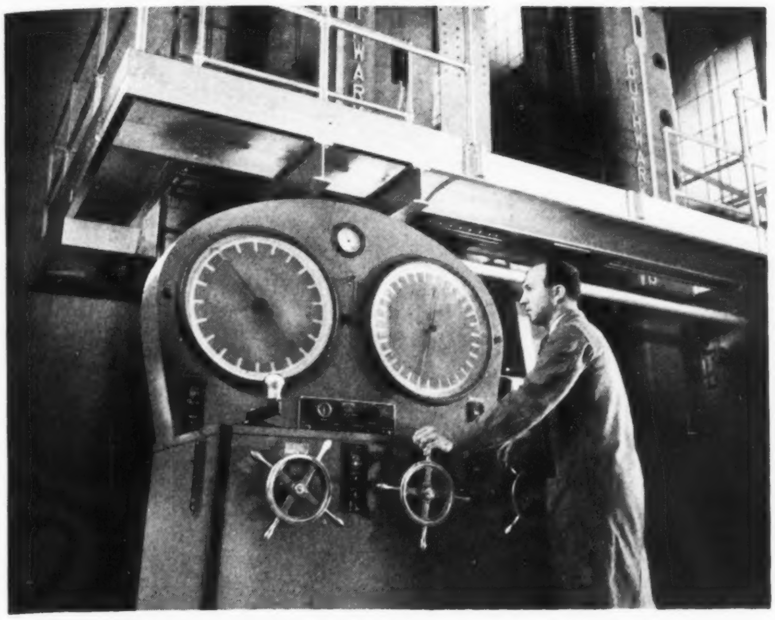
In addition to being a testing machine, this machine can be operated as an extrusion, forging, or forming press. It is also provided with auxiliary equipment that will permit defining, within close limits, the relationship existing between the various forces involved in the plastic flow of aluminum.

The height of the machine is slightly over 40 feet, of which 25 feet is above the floor line and 15 feet below. The width of the machine is over 16 feet, and it is 9 feet front to back. Ample space has been provided for the objects to be tested. In compression testing, 90 inches of space is available from right to left and 108 inches from front to back, the maximum height being 186 inches. In tension testing, a similar space is available from right to left, and the maximum height is 150 inches plus a 36-inch stroke. For tension testing, the dimension from front to back is not stated, since, theoretically, there is no limitation.

The main ram is 46 inches in diameter, with a 36-inch stroke; the pull-back rams are 12 inches in diameter. While the hydraulic stroke has a maximum range of 36 inches, the heads can be adjusted for the full height of the machine by means of a 50-H.P. motor. The motor rotates screws at both sides of the machine to obtain the desired position of the head. For testing large structural specimens, a pump delivering 18 gallons of oil per minute is driven by a 20-H.P. motor. For high-speed testing, when 270 gallons of oil per minute are required, a 300-H.P. motor is used.



Huge Templin Testing Machine Built by the Baldwin-Southwark Corporation, which was Recently Installed in the Research Laboratories of the Aluminum Co. of America at New Kensington, Pa. The Machine Extends 25 Feet above the Floor Level and 15 Feet below that Level



The Control Unit of the Templin Testing Machine

The extreme accuracy of the machine, necessary for its proper functioning is noteworthy. The machine is capable of measuring a load of 3,000,000 pounds with an error of less than two parts in a thousand. Its sensitivity is such that the weight of an average man moves the indicator nearly 1/4 inch, and the machine will actually record the pressure needed to crack the shell of an egg. The extreme accuracy of control of the machine was indicated in a recent demonstration test, when a watch was placed in the machine and the ram allowed to descend just far enough to break the crystal, no damage being done to the case or works.

* * *

Marked Increase in Gear Production

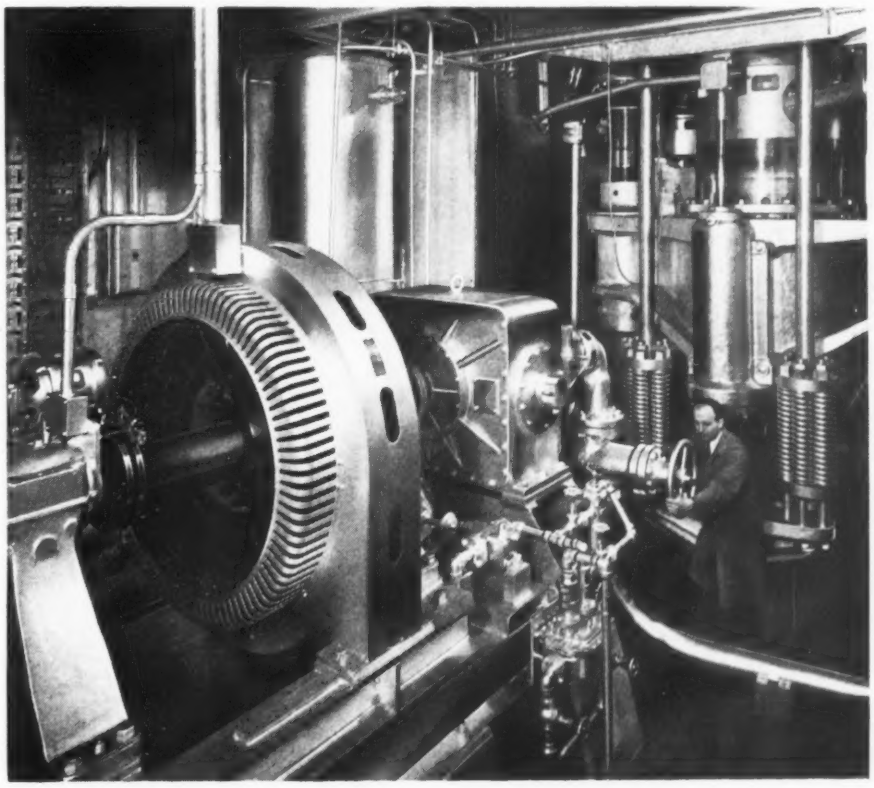
The American Gear Manufacturers Association, 602 Shields Bldg., Wilkinsburg, Pa., which represents the gear industry of the United States, announces that gear sales for February, 1940, were 35 per cent ahead of the sales for February, 1939, and that the total sales for the first two months of the present year were 35 per cent over the same period last year.

Acetylene Association to Meet in Milwaukee

The international Acetylene Association will meet at the Hotel Schroeder, Milwaukee, Wis., April 10 to 12. The program includes five technical sessions, at which will be presented papers covering almost every phase of oxy-acetylene cutting and welding practice. On Wednesday afternoon, April 10, papers will be read on the welding of carbon-molybdenum pipe; welding industrial piping; developments in silver soldering; and the lay-out and management of a modern welding shop. A simultaneous technical session will be devoted to the subject of reclamation, repair and maintenance, and will include papers on the use of the acetylene process for repair work in shipyards, foundries, steel mills, railroad shops, and on the farm.

Friday afternoon, April 12, there will also be two simultaneous technical sessions, one of which will deal with foundry and heavy industry applications of the oxy-acetylene process, and the other with fabrication and production; at the latter session papers will be read on the welding and brazing of light-gage metal, including stainless steel; design and construction of jigs and fixtures for sheet-metal welding; welding of aluminum; welding for enameling; and automatic bronze welding.

Round-table discussions will also be held during the meeting covering varied subjects pertaining to oxy-acetylene cutting and welding.



The Operating Machinery of the Testing Machine is Located below the Floor, where an Oil-pump and a 300-H.P. Motor Furnish Power to the Machine through the Hydraulic Cylinder at the Right

Wesson Standard Carbide-Tipped Tools

SINCE 1928, the Wesson Co., 1050 Mount Elliott Ave., Detroit, Mich., has produced special types of cutting tools with cemented-carbide tips. These special tools are designed for specific machining operations in production work. They bring to the job the advantages of longer life per grind, higher cutting speeds, and, as a result, lower cost of machining. Now the Wesson Co. is applying its twelve years of experience in this field to the manufacture of a new line of standard tools which includes counterbores and spot-facers, reamers, end-mills, inserted-tooth milling cutters, solid milling cutters, and core-drills. These tools are manufactured in quantities and stocked. As a result, the customer secures the advantage of the lower price made possible by producing each type and size of tool in quantities.

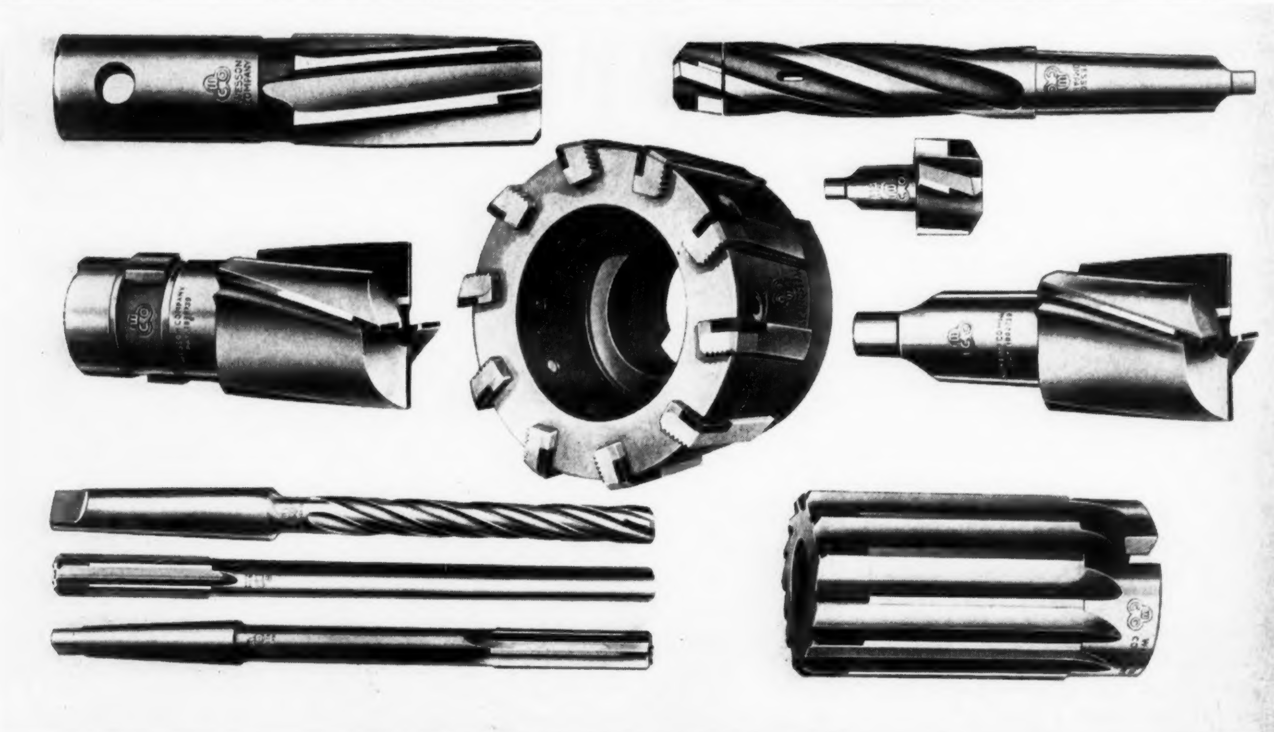
Particular attention is called to the procedure in manufacturing these types of tools. In the production of special tools in the past, the body of the tool was machined from steel, and the cemented-carbide cutting tips were brazed in place in an atmosphere of hydrogen in electric furnaces. A temperature of 2100 degrees F. was required for the brazing operation; this was too high a heat to enable the steel to retain its original metallurgical structure. As a result, it was impossible to perform a subsequent hardening operation; and while the carbide tips had all the advantages of long life and high production, the body of the tool was soft and wore rapidly in the case of such tools as reamers, where the body serves as a guide for the cutting tip while running through a bushing or following the tool into the hole.

In introducing the standard line of Wesson tools, it was necessary to overcome this difficulty. Research developed a steel, the temperature of which could be raised to 2100 degrees F. for the brazing operation without affecting the metallurgical structure. Consequently, as the tools are made today, the tips are brazed into place as usual. The tools are then heat-treated at 1450 to 1500 degrees F. and quenched to secure the required hardness.

In addition to lowering production costs through manufacturing these standard tools in quantities, there is a further economy factor. The recently lowered price for cemented carbides, together with the fact that the cemented carbides are now used in combination with a moderate-priced alloy steel for the tool bodies, makes it possible to offer to the trade these standard tools at commercially advantageous prices.

* * *

Gradually business has awakened to the fact that it has a stake in the perpetuation of democracy as great as that of the humblest citizen. Even more tardily, business is coming to realize that its problem is not only to sell goods, but to sell the American system to the American people.—*New York World-Telegram*



Some Types of Standard Carbide-tipped Tools Now Made by the Wesson Co.

American Society of Tool Engineers Holds Record-Breaking Meeting

MORE than six hundred members of the American Society of Tool Engineers gathered in New York from twenty-three states March 7 to 9 for what was undoubtedly the most successful annual meeting held since the Society was formed in 1932.

Under the sponsorship of the New York-New Jersey Chapter, of which Herbert D. Hall of the Herbert Hall Co., Newark, N. J., is chairman, the convention program provided for seven technical sessions covering the economics of tooling, precision small gears, tooling for plastics, screw machine tooling, punches and dies, tool engineering education, and cutting tools and materials. In addition, an annual dinner meeting was held, which was attended by about 500 people.

During the past year the Society has experienced an almost phenomenal growth. Approximately 1500 members were added, bringing the total membership up to about 4300. In appreciation of the splendid work done by the various chapter membership committees during the year, the national membership committee put up a handsome gold loving cup as a trophy. This was awarded at the annual dinner to the Hartford Chapter membership committee for its outstanding accomplishment during the year just past.

A certificate of life membership was also presented on this occasion to James R. Weaver, director of equipment, inspection, purchases, and tests of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., retiring president. In his speech, Mr. Weaver criticized our present educational methods as not providing adequate training for industrial jobs, and stated that large numbers of young men who had recently graduated were unemployed because of this failure on the part of many schools. Newbold Morris, president of the Council of the City of New York, also spoke at the dinner.

A report on causes of unemployment was presented by John Younger, Professor of Engineering, Ohio State University, and chairman of the American Society of Tool Engineers' Fact Finding Committee, in which he stated that one of the important causes of unemployment was the large number of failures of business enterprises. Professor Younger pointed out that the largest percentage of business failures has been found to be traceable to poor management. However, it was

The Officers Elected by the American Society of Tool Engineers for the Year 1940-41 are: President, A. H. d'Arcambal, Consulting Metallurgist, Pratt & Whitney Division Niles-Bement-Pond Co., Hartford, Conn.; First Vice-president, E. W. Dickett, Proposal Engineer, Sundstrand Machine Tool Co., Rockford, Ill.; Second Vice-president, Eldred A. Rutzen, Tool Engineer, Cutler-Hammer, Inc., Milwaukee, Wis.; Secretary, Conrad O. Hersam, Consulting Engineer, Philadelphia, Pa.; and Treasurer, Frank R. Crone, Chief Tool Designer, Lincoln Motor Co., Detroit, Mich.

A. H. d'ARCAMBAL

E. W. DICKETT

CONRAD O. HERSAM

FRANK R. CRONE

also emphasized that present-day governmental laws and regulations have deterred many from starting or continuing in business because of the severe penalties imposed in the form of taxes and expensive, time-consuming reports. The key to re-employment, he stated, is the production of new wealth, which should be fostered by government and industry alike.

In the technical session covering "Economics of Tooling," the various cost aspects of tooling for large and small products in varying quantities were discussed, R. H. Morris, chairman of the Hartford Chapter, presiding.

In the session on precision small gears, at which A. H. Mitchell, chairman of the Syracuse Chapter, presided, the topics of industrial requirements, and shaping and hobbing methods were discussed. One indication of progress in small gear development brought out was the fact that gears up to 125 pitch have been ground, and it is expected that gears of 200 pitch will soon be finished with precision by grinding.

In the session dealing with tooling for plastics, various tooling factors, molding processes for resin plastics, and injection molding of cellulose plastics, were discussed. Stanley S. Johns, chairman of the Baltimore Chapter, presided at this session.

In the session relating to screw machine tooling, the need for top rake on form tools, the factors in tooling aircraft engines, and the tooling of multiple-spindle automatics were discussed. At this meeting John R. Lynch, chairman of the Elmira Chapter, presided.

In the session covering punches and dies, factors concerning the selection and use of punches and dies for small and large products were discussed, E. W. Ernest, chairman of the Schenectady Chapter, presiding.

In the session on tool engineering education, the industrial requirements, the university viewpoint, the high school viewpoint, and the vocational viewpoint of tool engineering education were discussed, H. D. Hall, chairman of the New York-New Jersey Chapter and chairman of the National Educational Committee, presiding. One point brought up for discussion was the need of providing for the vocational education of young men between the ages of eighteen and twenty-one, in view of the increasing tendency of industry not to accept men for employment until the latter age has been reached. Another point was raised concerning the need for some correlation between industry and the various technical schools in providing practical shop experience, either by enlarging the equipment facilities in the technical schools or making arrangements for actual shop work by students in nearby manufacturing plants.

Although the technical session covering cutting tools and materials was the last one held, it was undoubtedly the best attended. A great deal of interest was evidenced in the discussion of industry's requirements in cutting tools and materials, developments in high-speed steel and in the carbide group of cutting tools and materials, as well as in the selection, use, and care of high-speed cutting tools. It was brought out in this session that for large production runs, remarkable reductions in tool costs could be effected by keeping careful records of experience with different tools and materials. In one of the many cases cited, the tool cost for roughing the top and bottom of cylinder castings had been reduced from $2 to 15 cents per block by careful record keeping and analysis.

It was stated that one electrical company, by the proper use, care, and selection of cutting tools, has saved over $100,000 in one year, giving clear indication of the need for careful attention to this phase of tool engineering.

The semi-annual meeting of the Society will be held in October at Cincinnati. The board of directors voted to hold a machine tool and progress exhibition in conjunction with the annual meeting in Detroit in March, 1941, as was done in 1939.

* * *

Metal-Working Machinery Exports in 1939 at Record Level

American metal-working machinery exports, according to statistics just made available by the Machinery Division, Department of Commerce, Washington, D. C., reached a total value of $117,474,000 in 1939, an increase of 16 per cent over 1938, when the exports were valued at $101,657,000. Of these exports, four countries—the United Kingdom, Japan, France, and Soviet Russia—took 81 per cent. It is of interest to note that the exports of metal-working machinery in 1929—a year that so frequently is held up for comparison—were only valued at $40,800,000. From this figure, the trade dropped to a low point of $9,369,000 in 1933.

From this low point, there was a gradual rise until 1936, when there was a sharp rise beginning with large purchases by the United Kingdom and Russia. These countries have continued to buy heavily in the United States, and in 1937, Japan and France also began to place large orders for metal-working machinery.

In 1939, the United Kingdom imported metal-working machinery from the United States to a value of over $33,000,000. The corresponding shipments to Russia were valued at $18,670,000, dropping from a record figure of $35,163,000 in 1938. The exports to Japan amounted to $24,839,000 and to France to $18,806,000. The next best foreign market for metal-working machinery from the United States in 1939 was Canada, the exports to that country being valued at $6,413,000.

* * *

The first calculating machine, according to *The Inventor*, is credited to Babbage, who built such a machine in 1822. Conceived as a mathematician's tool, it is now a business necessity.

Ohio Gear Company Completes Twenty-Five Years in Business

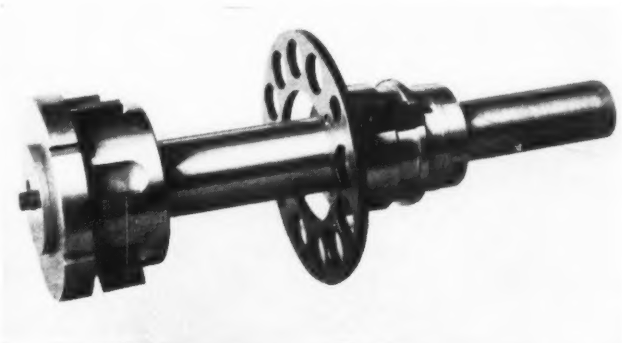
The Ohio Gear Co., Cleveland, Ohio, completes its twenty-fifth year in business this year. The company was founded in 1915 by Earl H. Browning under the name of the Machine Products Co., and was devoted to various kinds of machine work. Several products, including gears, were made and assembled in the plant. The production of gears occupied more and more of the company's capacity until, in 1929, the corporate name was changed to the Ohio Gear Co. and the entire plant was devoted to the production of gears and speed reducers.

In 1931, Mr. Browning passed away, and his son, Harrison Browning, succeeded as president of the company. Under his management the business has experienced a considerable growth. Its capacity is now more than four times that of ten years ago, and it counts among its customers many of the best known industrial concerns throughout the country.

* * *

Geometric Tap Developed for Deep-Hole Tapping

The special 8-inch Geometric Class S lengthened collapsing tap shown in the accompanying illustration is equipped with roller pilots for deep-hole tapping in massive castings used in marine equipment. In general design, this tap is similar to the Class S type general-purpose collapsing taps made by the Geometric Tool Co., New Haven, Conn. It is designed for cutting a range of sizes from 8 1/2 to 10 inches in diameter, eight threads per inch. An unusual feature of this tap is the special adjusting ring that makes it possible to take roughing and finishing cuts with one tool.



Geometric Collapsing Tap for Deep-hole Work

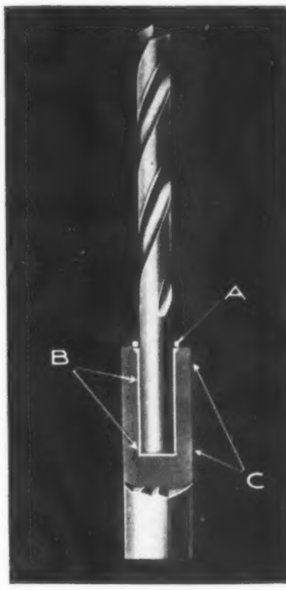
* * *

Since the strength and stiffness of stainless steel makes it resistant to dents, designers frequently resort to the use of stainless-steel sheets as a covering for cheaper base metals.

Quick Method of Applying Large Shanks to Small Drills

Recently a Midwest plant requiring some 3/16- by 5/16-inch straight-shank drills with larger shanks, 1/2 to 5/8 inch in diameter, devised an inexpensive method of building up the shanks of the small drills to the desired size, as described below.

New cold-rolled steel shanks of the required outside diameter were turned and drilled to give a clearance of 0.002 to 0.003 inch when the drills were inserted. The drill shanks and the holes in the new shanks were cleaned and treated with flux. The drills were then placed in the holes in the shanks, after which a ring of "Easy-Flo" silver brazing alloy, made by Handy & Harman, 82 Fulton St., New York City, was placed around the drill, as shown at *A* in the illustration. The shank was then heated with a torch between the points indicated by arrows *C*. When a dull cherry red color was obtained, the silver alloy *A*, which flows freely at 1175 degrees F., flowed freely between the drill and the new shank, as indicated at *B*.



Method of Fitting Large Shank to Small Drill

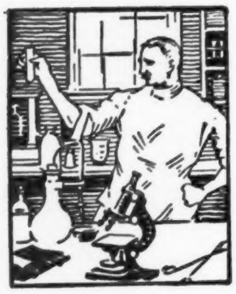
Several of the brazed joints that were cut apart showed that the brazing alloy had penetrated to the bottom of the hole in which the drill had been inserted. Thus the two parts were bonded firmly together. Further tests under severe operating conditions resulted in broken drills, but did not cause the brazed joints to fail. Although the heat required for brazing brought the shank to a dull cherry red, it was confined to the shank, and the joint was cooled immediately after brazing, so that the hardness of the cutting end of the drill remained unchanged.

* * *

Proposed Standard for Engineering and Scientific Graphs

A proposed American standard for engineering and scientific graphs for publication has recently been completed by a committee of the American Society of Mechanical Engineers. The proposed standard is now being distributed to industry for criticism and comment. Copies are available upon application to C. B. LePage, Assistant Secretary, the American Society of Mechanical Engineers, 29 W. 39th St., New York City.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Hastelloy Corrosion-Resistant Alloy-Steel Sheets

Rolled sheets and plates of Hastelloy Alloy C, a corrosion-resistant nickel-molybdenum-chromium iron alloy, are now being made by the Haynes Stellite Co., 30 E. 42nd St., New York City. Until a short time ago, this alloy was commercially available in the form of castings only. Now sheets and plates weighing up to 100 pounds each are being made, and the alloy can be produced in practically any commercial sheet thickness.

This alloy withstands strong oxidizing agents, such as acid solutions of ferric or cupric salts and aqueous solutions containing chloride or hypochlorites. It is one of the few metallic materials that will withstand wet chlorine. It also has good resistance to hydrochloric acid up to 120 degrees F., and to sulphuric acid at temperatures up to 160 degrees F., if the concentration is over 50 per cent; or up to the boiling point, if the concentration is under 50 per cent.

In the rolled form, the alloy has a tensile strength of over 75,000 pounds per square inch, and an elongation and reduction of area of about 15 per cent. Sheets and plates of this alloy are now being used in many types of processing equipment involving severe corrosion-resisting problems..201

Paste Solder Simplifies Soldering and Tinning Operations

Soldering and tinning operations have been simplified by the development of a paste solder known as "Meltomatic," which is being introduced in the industrial field by the Wayne Chemical Products Co., Detroit, Mich. This solder is simply brushed on the metal where needed and then heated with a gas or other flame, electricity, hot oil, or in a furnace. The solder will melt at a temperature slightly higher than 400 degrees F.

Soldering can be done quickly by this method because no time need be spent in cleaning the metal surfaces preliminary to the operation. Another advantage of the paste solder is that it is applicable in cases where soldering irons are difficult to manipulate, as in soldering small articles, and enables small spaces to be reached that are inaccessible to ordinary solder stock. Several articles or units can be soldered at the same time........202

Cast-to-Form Dies and Punches Made from Meehanite

The desirable combination of properties available in Meehanite have led to the adoption of this high-test cast iron for making cast-to-form dies and punches. In one English plant, where tubular parts were previously formed from stainless steel in dies of ordinary cast iron, the dies had to be redressed after every 200 stampings. When Meehanite dies were substituted for this work, 10,000 stampings were produced.

The much greater life of Meehanite dies and punches is said to be due to the development of a high molecular mobility under extreme pressures, which results in the working surfaces of the dies quickly acquiring a high polish. It also insures an unusual degree of surface hardness. Furthermore, since the constitutional graphite is distributed uniformly and homogeneously, heavy pressure results in a fine surface coating of graphite, which acts as a lubricant and protects the die from scoring and seizing.

Meehanite can be used as a die material in the "as cast" condition, heat-treated and drawn to machinable hardness, or flame-hardened, depending on the design of the die and the work to be performed.

As there are no joints in cast-to-form dies, the large amount of precision work necessary when oil-hardened or tool-steel inserts are employed is eliminated. Initial machining costs have been reduced as much as 60 per cent, and the buffing costs greatly lowered or entirely eliminated. Dies can be readily cast from Meehanite to intricate shapes and accurate dimensions.

In cases where stampings are to be manufactured from heavy-gage steels with severe drop and sharp corners, the practice is to harden the dies by

To obtain additional information about materials described on this page, see lower part of page 174.

oil-quenching from 1580 degrees F. They must be removed from the bath while steaming (about 300 degrees F.). This treatment is followed immediately by tempering at from between 400 and 935 degrees F., according to the required physical properties.

Hardness values from 250 to 600 Brinell can be obtained in combination with tensile strengths up to 78,000 pounds per square inch and a Charpy impact reading of 12 foot-pounds. In the "as cast" condition, the material has a tensile strength of over 51,000 pounds per square inch, a compression strength of more than 156,000 pounds per square inch, a hardness between 207 and 227 Brinell, a Charpy impact value of 5 foot-pounds, and a modulus of elasticity of 21,000,000...............203

High-Strength Waterproof Adhesive for Joining Metals

An adhesive known as "Strangl-Hold" has been developed by the Colonial Alloys Co., E. Somerset St. and Trenton Ave., Philadelphia, Pa., for joining metal to metal, as well as for joining other materials to one another or to metal. For example, this adhesive will join metal to glass, wood, and other materials; glass to glass; wood to wood; and glass to wood. Other combinations are rubber to wood, glass, metal, felt, or leather. A metal-to-metal joint, 3 by 3 inches square, will support approximately 1350 pounds. A glass-to-metal joint of the same size will support up to 1650 pounds.

The adhesive consists of two ingredients, a powder and a liquid, which are quite stable when unmixed, but should be used within an hour or two after mixing. The thickness of the coat applied is about 0.010 inch. The adhesive dries to a black color. It is unaffected by many corrosives, but is attacked by rubber solvents and by copper and manganese in solution. Besides being an unusual adhesive for joining materials, it is said to be an excellent coating for protecting materials of all kinds against atmospheric action and corrosion. It requires no heat or pressure in its application, as the material is simply painted on the surfaces..204

Synthetic Coating Protects Conveyor Belting

Protection of conveyor belting from deterioration through the action of sunlight and air, particularly during idle periods, can be accomplished by the aid of a new synthetic coating known as R-60-T. This coating was developed by the B. F. Goodrich Co., Akron, Ohio. It is brushed on as a liquid and need not be removed when the belt is again placed in service. It can be applied to belts of all types, and does not affect the length of service life when operation is resumed.

Samples of conveyor belting coated with the protective compound were placed under severe tension and exposed to all varieties of weather for a period of six months. At the end of that time no deterioration of the covering was evident.....205

Stainless-Steel "Lumber" for the Construction Field

Thin sheets of Allegheny metal (18-8 stainless steel), permanently bonded to an inert mineral backing material, so as to form strong rigid panels of convenient building size, have been produced under the name "Ludlite Bord" by the Ludlite Division, Watervliet, N. Y., of the Allegheny Steel Corporation. The outer surface of these panels retains the normal beauty and utility of stainless steel. The mineral backing material is relatively inexpensive, consisting of asbestos fibers, Bentonite (volcanic clay), Portland cement, and calcined magnesite. It is processed under high pressure, and bonded to the stainless steel facing in a pressure-cementing process. The coefficient of expansion of the backing material closely approximates that of the stainless steel, so that distortion does not occur under ordinary temperatures.

Ludlite Bord is made in two standard-sized panels, 2 by 4 and 2 by 8 feet. It comes in standard thicknesses of 1/8 and 1/4 inch, which weigh 1 1/2 and 2 1/2 pounds per square foot, respectively. This stainless-steel "lumber" can be sawed to shape with an ordinary hand saw, sheared as easily as plain sheet metal, and drilled as readily as ordinary hard-wood. 206

New Lubricant Developed for Packings

A packing lubricant intended for application to the exterior surfaces of a packing prior to its installation and for application directly to stuffing boxes after the installation has been made, has been developed by the Industrial Colloids Corporation, 1314 W. Cermak Road, Chicago, Ill. The compound, known as Formula No. 610725, in addition to being a very durable lubricant, is said to form an actual metallic surface or covering on the packing coated. This metallic surface, when in contact with the moving member, attains a polish or glaze almost instantly. It offers a considerable reduced coefficient of friction, an effective seal, with a minimum of shaft wear, assurance against possible scoring, and ability to maintain and preserve the initial flexibility and resiliency.

The compound is not restricted as to pressure, and is recommended for all temperatures up to 1000 degrees F. It is suitable for application on all types of packing—whether metallic or fibrous. 207

To obtain additional information about materials described on this page, see lower part of page 174.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of Page 173 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the April Number of MACHINERY

Balancing Machines

GISHOLT MACHINE CO., 1209 E. Washington Ave., Madison, Wis. Catalogue 1079, announcing the Gisholt line of static and dynamic balancing machines for locating and measuring unbalance in rotating parts. The fundamental principles underlying the balancing procedure are described, as well as the equipment used. 1

Hydraulic Presses and Steel Fabricating Machines

HANNIFIN MFG. CO., 621-631 S. Kolmar Ave., Chicago, Ill. Bulletin 49, covering the complete line of steel fabricating equipment manufactured by the Rock River Machine Division of this company. Bulletin 50, descriptive of the new sensitive pressure control for Hannifin hydraulic presses. 2

Precision Saws and File Bands

CONTINENTAL MACHINES, INC., 1312 S. Washington Ave., Minneapolis, Minn. Circular on Doall precision contour saws and the class of work for which the different types are adapted. Bulletin covering Doall precision file bands, including information on the materials for which the various types are recommended and price lists. 3

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Circular GES 2377, entitled "Electric Heat in Industry"; 2948, on GE atmosphere-gas converters for controlled-atmosphere furnaces; 3313, on the GE welder recorder for use in spot welding; and 3330, on GE insulation for polyphase induction motors. 4

Machine Tools

WICACO MACHINE CORPORATION, Stenton Ave. and Louden St., Philadelphia, Pa. Bulletin entitled "Plant Views," illustrating the plant facilities of the company and typical examples of the line of precision machine tools produced. 5

Varidrive Motors

U. S. ELECTRICAL MOTORS INC., 200 E. Slauson Ave., Los Angeles, Calif. Bulletin entitled "A Thousand Speeds at the Turn of a Wheel," describing the U. S. Varidrive motor, designed to meet the demand for a wide and progressive range of variable speed. 6

Carbide-Tipped Tools

MCKENNA METALS CO., 147 Lloyd Ave., Latrobe, Pa. Catalogue 3, on the care and use of carbide-tipped tools, containing complete descriptions, drawings, and recommended uses for standard Kennametal tools and blanks suitable for turning, boring, and facing steel and other metals. 7

Automatic Hob-Sharpening Machines

BARBER-COLMAN CO., Rockford, Ill. Circular F1011-2, illustrating and describing the Barber-Colman improved No. 4 automatic hob-sharpening machine for sharpening straight and helical gashed hobs and formed cutters up to 10 inches diameter. 8

Recording and Indicating Instruments

BRISTOL CO., Waterbury, Conn. Bulletin 546, describing the new Rockwell-Bristol dilatometer. Bulletin 542, descriptive of Bristol recording and indicating tachometers for measuring speed of rotation and speed of travel. 9

Electric Painting Machine

JAS. H. MATTHEWS & CO., 480 Canal St., New York City. Catalogue announcing a new airless electric hand painting machine for inside or outside painting of factories, stores, houses, etc., and for industrial coating, waterproofing, stenciling, and similar operations on large areas. 10

Stock Gears

BRAD FOOTE GEAR WORKS, 1301 S. Cicero Ave., Cicero, Ill. Catalogue 110, listing Brad Foote stock gears, reducers, cog belts, sprockets, bearings, pulleys, and chain, ready for prompt delivery. An engineering section containing trigonometrical tables and other data is included. 11

Limit Switches

MICRO SWITCH CORPORATION, Freeport, Ill. Data Sheet No. 8, containing information on Type LK interchangeable precision limit switches. Data Sheet No. 20, covering Micro switches for the precision electrical switching of loads up to 1200 watts at 600 volts or less. 12

Power Transmission Equipment

PYOTT FOUNDRY & MACHINE CO., 328 N. Sangamon St., Chicago, Ill., is distributing index cards containing condensed data on the line of Pyott products, which includes ball bearings, castings, chains, couplings, gears, pulleys, sheaves, sprockets, and V-belts. 13

Broaching Machines

OILGEAR CO., Milwaukee, Wis. Bulletin 23001, describing single-slide vertical surface broaching machines with automatic shuttle tables. Bulletin 24001, on double-slide vertical surface broaching machines with automatic shuttle tables. 14

Welded Chains

AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn. Catalogue 365, on welded chains, including Endweldur chains and iron crane chain. Information is given of value in selecting the proper chain for a particular use. 15

Fuses

TRICO FUSE MFG. CO., 2948 N. 5th St., Milwaukee, Wis. Catalogue Folder 300, entitled "Fourteen Big Trouble Savers," containing complete specifications and illustrations of the line of Trico fuses. 16

Threading Equipment

LANDIS MACHINE Co., INC., Waynesboro, Pa. Bulletin illustrating and describing Landis threading equipment, including threading machines, die-heads, collapsible taps, chasers, and chaser grinders. 17

Grinding Machines

BERGRAM MECHANICAL ENGINEERING Co., INC., New Britain, Conn. Catalogue illustrating and describing the different types of Bergram Utility grinders for grinding reamers, milling cutters, taps, etc. 18

Die-Hardening Electric Furnace

WESTINGHOUSE ELECTRIC & MFG. Co., East Pittsburgh, Pa. Folder F-8541, giving details of a die-hardening electric furnace with ammogas atmosphere for the bright hardening of dies and tool steel. 19

Drying Lamps

GENERAL ELECTRIC Co., Schenectady, N. Y. Circular Y-072, on drying lamps for drying industrial and automotive finishes, motor and transformer windings, blueprints, and a wide range of other products. 20

Welding and Cutting Equipment

VICTOR EQUIPMENT Co., 844 Folsom St., San Francisco, Calif. 1940 catalogue on welding and cutting equipment, including torches, nozzles, safety regulators, welding and cutting units, etc. 21

Hydraulic Shapers

ROCKFORD MACHINE TOOL Co., Rockford, Ill. Circular illustrating and describing the improved line of Rockford Hy-Draulic shapers, which includes 16-, 20-, 24-, and 28-inch sizes. 22

Materials-Handling Equipment

CLEVELAND CRANE & ENGINEERING Co., Wickliffe, Ohio. Bulletin illustrating applications of Cleveland cranes and overhead tramrail systems, as well as Steelweld bending presses and bulldozers. 23

Meehanite Metal Chart

MEEHANITE RESEARCH INSTITUTE OF AMERICA, INC., 311 Ross St., Pittsburgh, Pa. Circular slide-rule chart, giving complete engineering data and physical properties of various types of Meehanite castings. 24

Metal Coating Equipment

METALLIZING ENGINEERING Co., INC., 21-07 Forty-first Ave., Long Island City, N. Y. Bulletin P-11, describing the "Metcolizing" process for protecting metals exposed to heat from corrosion. 25

Magnetic Chuck Energizer

STURDY TOOL & ENGINEERING Co., 14520 Shaefer Highway, Detroit, Mich. Leaflet describing a new, efficient, and inexpensive means of energizing magnetic chucks without the use of a generator. 26

Corrosion-Resistant Conveyor Chains

LINK-BELT Co., 307 N. Michigan Ave., Chicago, Ill. Folder 1804, on bronze drive and conveyor chains designed to resist the destructive effect of acids. 27

Link Leather Belting

ALEXANDER BROS., 406 N. 3rd St., Philadelphia, Pa. Booklet illustrating and describing a new Duplex link leather belting, which is claimed to have exceptional durability and efficiency. 28

Rexalloy Cutting Material

CRUCIBLE STEEL Co. OF AMERICA, 405 Lexington Ave., New York City. Bulletin giving information on the new cast cutting material "Rexalloy," including actual performance data. 29

Helical Springs

LEE SPRING Co., INC., 30 Main St., Brooklyn, N. Y. Spring Specification Form containing data of value to engineers and designers in checking spring calculations. 30

Gear-Hobbing Machines

GOULD & EBERHARDT, Newark, N. J. Bulletin 218, illustrating and describing the Gould & Eberhardt new line of universal, manufacturing type, gear-hobbing machines. 31

Vibration Control

KORFUND Co., INC., 48-15 Thirty-second Place, Long Island City, N. Y.

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Bulletin discussing vibration control of concrete foundations for machines, and the Korfund vibro-isolator. 32

Electric Equipment—Rectifiers

CASSELS ENGINEERING AND MACHINE Co., Box 114, Wauwatosa, Wis. Bulletin RC1-18, entitled "Porto-Rect Primer," covering power rectifiers for speed control and magnetic devices. 33

Leather Belting

CHICAGO BELTING Co., 113 N. Green St., Chicago, Ill. Condensed catalogue covering the improved tension-welded leather belting made by this concern. 34

Industrial Scales

TOLEDO SCALE Co., Toledo, Ohio. Circular illustrating representative models of three new motor truck scale lines being introduced by the company. 35

Thrustor-Operated Valves

GENERAL ELECTRIC Co., Schenectady, N. Y. Circular GEA-1569B, describing Thrustor-operated valves for pipe sizes of 1 to 10 inches. 36

Conveyors

ALVEY CONVEYOR MFG. Co., Broadway, Wyoming, and Seventh Sts., St. Louis, Mo. Circular showing various applications of Amco conveyors in industrial plants. 37

Silver Brazing Alloys

HANDY & HARMAN, 82 Fulton St., New York City. Twenty-eight page book giving detailed information on silver brazing alloys in the marine field. 38

Mounted Grinding Wheels

CHICAGO WHEEL & MFG. Co., Chicago, Ill. General catalogue covering Chicago mounted grinding wheels and their uses on a wide variety of work. 39

Welding Equipment

WESTINGHOUSE ELECTRIC & MFG. Co., East Pittsburgh, Pa. Circular descriptive of the Weld-O-Trol power switch for resistance welders. 40

Socket Screws

BRISTOL Co., Waterbury, Conn. Bulletin 840, containing data on sizes and prices of Bristo socket screws of multiple spline design. 41

Industrial Ovens and Dryers

GEHNRICH CORPORATION, Long Island City, N. Y. Catalogue 107, on Gehnrich ovens and driers for industrial heating processes. 42

Aluminum V-Belt Sheaves

STERLING ALUMINUM PRODUCTS, INC., 2925 N. Market St., St. Louis, Mo. Bulletin on heat-treated aluminum-alloy V-belt sheaves. 43

Variable-Speed Pulleys

SPEEDMASTER Co., Des Plaines, Ill. Folder describing the Speedmaster stepless speed-change pulley and illustrating various applications. 44

Springs

FORT PITT SPRING Co., P. O. Box 1377, Pittsburgh, Pa. Catalogue 4, covering the line of coil and elliptic springs made by this concern. 45

* * *

Low-Priced Experimental Photo-Electric Set

Rehtron Corporation, 2159 Magnolia Ave., Chicago, Ill., manufacturer of photo-cells and commercial photo-electric equipment, has developed a completely assembled photo-electric and capacity relay experimental set which is available at a low price. This set is not a toy or novelty, but a simplified multi-purpose apparatus capable of practical applications and suitable for industrial experiments. An instruction book with diagrams, written in non-technical style, is available with the equipment, which comes ready to plug into any 115-volt, 50- to 60-cycle outlet.

* * *

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[SEE OTHER SIDE]

Shop Equipment News

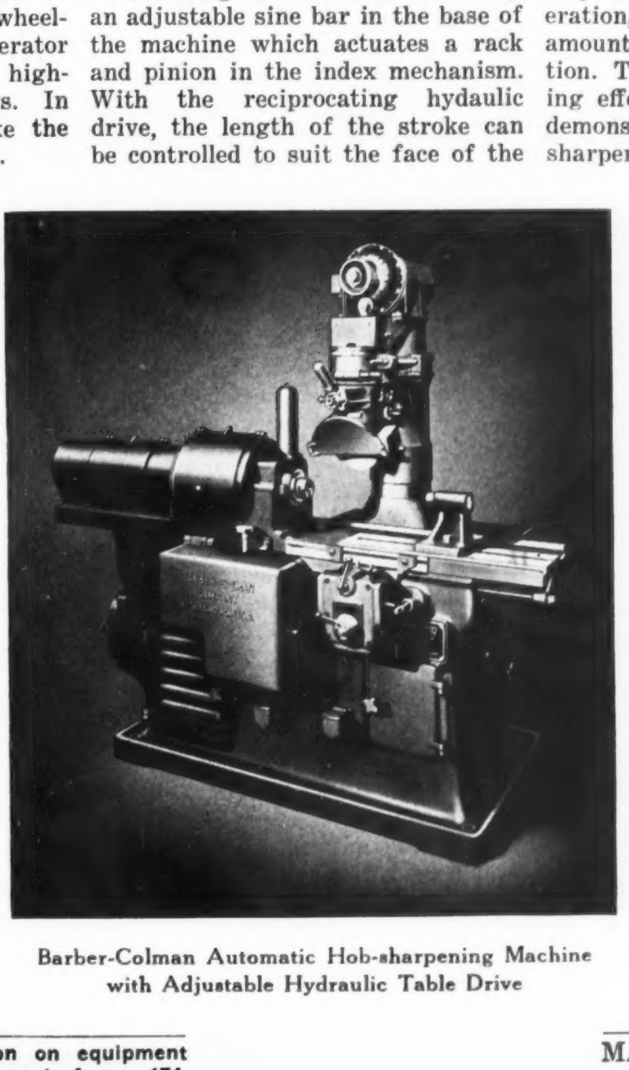
Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Barber-Colman Automatic Hob-Sharpening Machine

A new No. 4 automatic hob-sharpening machine of improved design, with an adjustable hydraulic table drive and electrical control, has been brought out by the Barber-Colman Co., 203 Loomis Blvd., Rockford, Ill., to fill the need for a machine of larger capacity than is available with any of the previous models. The new machine is adapted for the precision automatic regrinding of hobs and formed milling cutters in sizes up to 10 inches in diameter and 12 inches in face width. Outstanding features include the hydraulic table drive, which affords instant control of traversing speed, and a spiral wheel-dresser, which enables the operator to grind true radial faces on high-spiral hobs or formed cutters. In most other respects, it is like the No. 3 automatic hob-sharpener.

An upright supports the wheel head and its individual motor drive. The motor-spindle is set at an angle to bring the rear convex cutting face of the wheel in a vertical position where it meets the work. The entire wheel-head can be raised or lowered to suit the size of the work, and the wheel-spindle can be run back as the wheel is worn and redressed. For helical work, the wheel can be swung about a vertical line which intersects the work center line, up to 30 degrees either side of the zero point. A straight-line wheel-dresser is built into the wheel guard for dressing the face of the grinding wheel for straight-gashed and slightly spiral hobs. Traversing the dresser head automatically puts a straight face on the wheel.

The table carries the work between centers and has a reciprocating movement, passing the tooth faces across the fixed-position grinding wheel. The table also contains an automatic mechanism for indexing the work, or turning it between strokes from gash to gash. A feed control on the index mechanism advances the work after a complete circuit of indexing, so that a predetermined amount of metal will be removed from the tooth faces on the succeeding circuit. Spiral-gashed hobs are accurately rotated a part of the turn during the traverse stroke by an adjustable sine bar in the base of the machine which actuates a rack and pinion in the index mechanism. With the reciprocating hydaulic drive, the length of the stroke can be controlled to suit the face of the work by means of an adjustable dog, and the speed of traverse can be adjusted at any time, even while the machine is in operation.



Barber-Colman Automatic Hob-sharpening Machine with Adjustable Hydraulic Table Drive

The adjustable traverse speed offers some interesting advantages in hob-sharpening work. It has been found, for instance, that the life of the hob between grinds can be materially increased by giving the faces of the teeth a finer finish.. This is accomplished by slowing down the table speed on the last indexing circuit. The smoother surface obtained offers less resistance to the curling chip during the actual hobbing operation, and thereby reduces the amount of heat generated by friction. This, in turn, lessens the burning effect on the cutting edge. As demonstrated in actual practice, hobs sharpened in this way cut a materially greater number of gears between grindings.

The automatic index mechanism consists of a latching stop arrangement which engages successive notches in the periphery of an accurately hardened and ground index-plate. A separate plate containing the proper number of notches is used for work having a different number of gashes. As the over-and-back cycle of the table is completed, the index-plate is released, then rotated by a special drive until the stop latches into the next notch, by which time the next stroke begins. Change-gears permit varying the speed of the rotating mechanism, in order to obtain a speed of operation commensurate with the size and length of the work and the time available for indexing.............51

To obtain additional information on equipment described on this page, see lower part of page 174.

Heavy-Duty "Red Ring" Gear Shaving Machine

Great strength and rigidity are characteristic of the new model "Red Ring" gear shaving machine introduced on the market by the National Broach & Machine Co., 5600 St. Jean, Detroit, Mich. The frame of this new machine is of heavy, one-piece, C-type construction designed to eliminate "spring" and give exceptionally solid support to the cutter-head and to the lead-screw under the knee.

A gashed helical-gear form tool is used in mesh with the work gear, the axes of the work gear and cutter being crossed at an angle, usually 10 to 15 degrees. The cutter gear drives the work gear, as the latter is traversed back and forth across it. Stock is removed in fine, hair-like shavings, with a true cutting action. Tooth profiles, spacing, eccentricity, and helical angle are corrected, and a bright, smooth tooth surface is produced. Horizontal serrations that give a washboard effect are thus eliminated. The profile is corrected by the generating action to within 0.0001 inch of the exact form desired.

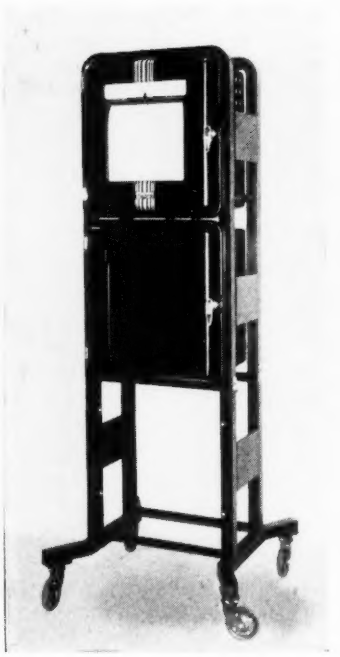
This machine also provides for crowning gear teeth by means of an adjustable cam that tilts the table slightly, making it follow a curve instead of a straight path. This produces teeth that are slightly thinner at the ends then at the middle. The work-table is of heavy construction, 7 1/2 inches deep, and has a surface 10 by 35 inches. All moving parts in the knee are force-feed lubricated. Individual motor drives are used on the cutter-spindle, table, and oil-pump.

The automatic feed-box is so designed that settings for feeds of 0.001, 0.002, 0.003, or 0.004 inch can be obtained quickly by means of a knob. The cycle of the machine, including feed, and the required number of strokes can be set for automatic operation, so that the operator need only mount the gear and start the machine, which stops when the gear is completely processed. Relays designed to prevent over-run of the work make it possible to work close to a shoulder. 52

"Red Ring" Gear Shaving Machine of New Design

Leeds & Northrup High-Speed Temperature Recording Equipment

A completely redesigned, standardized, and simplified Speedomax pyrometer has been brought out by the Leeds & Northrup Co., 4921 Stenton Ave., Philadelphia, Pa., for use in steel mills and wherever the recording of changes in temperature and other variables is necessary. This new Speedomax is designed to draw a continuous curve or line representing the temperatures of moving billets, slabs, rails, etc. The curve shows not only the temperature of the work, but also the temperature gradient between its ends. The chart thus produced serves as a reliable guide for accurately controlling the successive rolling mill operations.



Leeds & Northrup Temperature Recording Equipment

The recorder has many other uses; for example, in the field of scientific research it is employed for the recording of temperature, pressure, and humidity measurements radioed from high altitudes. It is also used for speed, radio field strength, and microphotometer measurements. 53

Automatic Whiteprint Machine Brought out by the Ozalid Corporation

Ozalid Automatic Whiteprint Machine

The Ozalid Corporation, Johnson City, N. Y., has brought out a new high-speed, automatic, whiteprint machine designed to produce Ozalid positive type prints developed dry at speeds ranging up to 20 linear feet per minute. Uniform exposure is assured by the use of a single, high-pressure, mercury-vapor tube developed especially for this machine. An outstanding feature is the automatic separation of the original and the print. The operator, standing in front of the machine, merely feeds the original and the sensitized material into the printer. When the exposure

To obtain additional information on equipment described on this page, see lower part of page 174.

is completed, the original and the print are not only separated automatically, but the original is returned to the operator, while the print is carried through the developer and discharged at the rear of the machine, dry and ready for use.

Either cut sheets or the continuous-roll print material can be handled automatically. A speed control and a speed indicator for the full range of the machine are located in front of the unit. A variable transformer is included in the primary circuit of the transformer, which permits varying the intensity of the lamp from full brilliancy to 60 per cent maximum, so that uniform whiteprints can be obtained regardless of variations in tracings. The unit is built for operation on 220-volt, 60-cycle, single-phase, alternating current, and consumes approximately 7 1/2 kilowatts per hour. 54

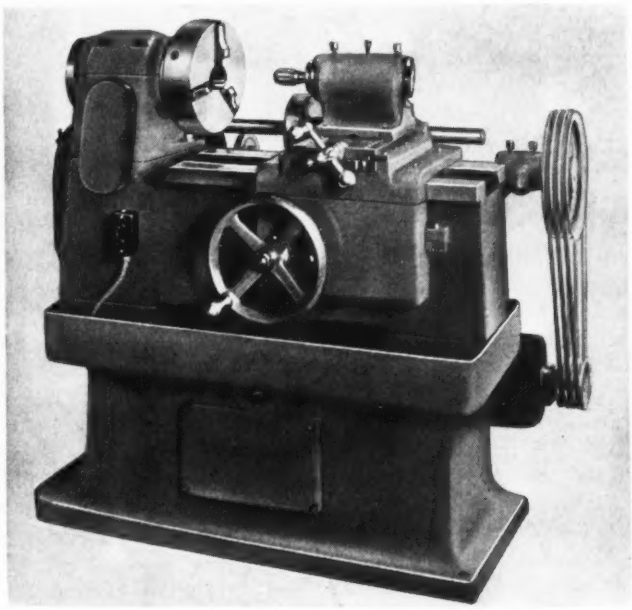
Coulter Semi-Automatic Hob Thread-Milling Machine

The Type H hob thread-milling machine here illustrated is the latest development of the James Coulter Machine Co., 386-404 Mountain Grove St., Bridgeport, Conn. The bed of this machine is mounted on a substantial base with an enclosed lubricant tank. The work-spindle has a 4-inch hole and a flanged end on which a universal chuck, master collet chuck, or fixtures can be readily attached.

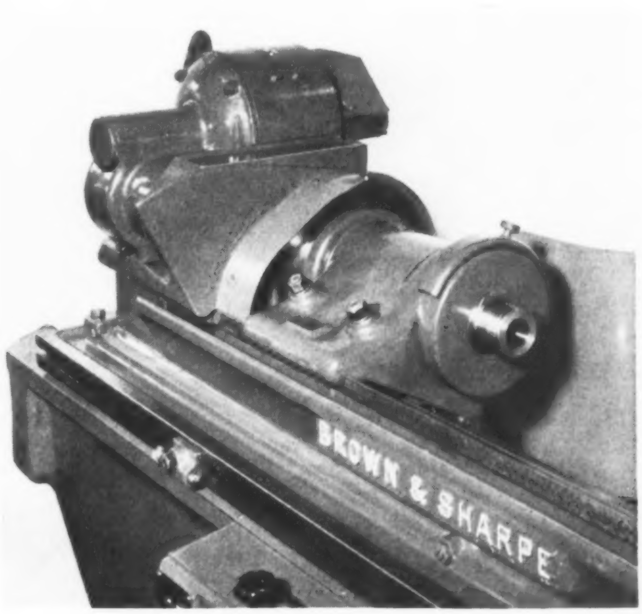
The machine has a milling spindle of large dimensions, and taper bearings with take-up adjustments; a worm-gear drive direct from the motor; suitable pick-off gearing for varying the speeds or feeds as required for milling work of various diameters. With the camshaft control of this machine, it is only necessary to set the hob to the exact depth on the first piece milled, after which duplication is accomplished without any manual adjustments.

After chucking the work, the cutter is brought up to the stop and the starting button pushed, causing the hob to feed to the exact depth. The work revolves 1 1/5 turns, the hob withdraws, and the machine stops to permit removal of the work. The standard machine is equipped with two motors, one for driving the work-spindle and the other for driving the hob-spindle. One 12-inch, three-jaw, hand-operated scroll chuck, and one hob cutter are also furnished. Extra master collet chucks and collet inserts for either hand or air operation can be provided as extra equipment.

The length of the machine bed is 52 inches; the swing over the carriage, 14 inches; and the distance from the head to the hob, 21 inches. The maximum capacity for external threading is 7 inches. The machine takes hobs with No. 10 B. & S. tapered shanks. The machine occupies a floor space of 60 by 38 inches, and weighs 3000 pounds. 55



Semi-automatic Hob Milling Machine Built by the James Coulter Machine Co.



Revolving-spindle Headstock for Brown & Sharpe Grinding Machines

Revolving-Spindle Headstock Equipment for B. & S. Grinding Machines

The Brown & Sharpe Mfg. Co., Providence, R. I., has added to its line of attachments for its Nos. 20, 22, and 23 plain grinding machines revolving-spindle headstock equipment designed for use when the work calls for a chuck, spring collet, or driving center, and when the full table capacity of the machine is not required. This equipment is intended for use where the work handled does not warrant the installation of a motor-driven revolving-spindle headstock.

It consists of a spindle mounted on sealed, preloaded, super-precision ball bearings in a casting which is clamped on the table ways at the right of the machine headstock. The spindle is driven directly by the work driving plate of the regular headstock. The use of this unit reduces the length capacity of the machine by 14 inches. The threaded front end of the spindle has four right-hand National Standard 2 3/4-inch diameter threads and a No. 11 B. & S. taper hole. The straight hole through the spindle is 1 1/16 inches in diameter. This revolving-spindle headstock equipment is furnished at extra cost, and must be fitted to the machine at the factory. It has a net weight of approximately 140 pounds. 56

To obtain additional information on equipment described on this page, see lower part of page 174.

Cincinnati Rapid-Traverse Shapers with Improved Features

The Cincinnati Shaper Co., Cincinnati, Ohio, is now building universal type shapers in sizes from 16 to 36 inches that are designed for even higher efficiency and heavier cutting capacities than previous models. Speeds up to 200 strokes a minute are obtainable, for example, on the 16-inch size. Outstanding features include power rapid traverse, multiple-cam feeds, direct-reading dials, and automatic oiling.

The feeding motion is actuated by an eleven-step cam, cut from the solid in one piece, which eliminates the usual eccentric and ratchet or single-step cam arrangements. The step cam gives a smooth rather than abrupt movement. Thrust bearings on each end of the feed-screw make hand-feeding particularly easy. The usual feed-box on the end of the cross-rail has been transferred to the side of the column to give more working space.

Eleven feeds ranging from 0.010 to 0.170 inch are regularly provided, the amount of feed being controlled by a lever mounted on a direct-reading dial that indicates the amount of feed in thousandths of an inch. An optional range of eleven feeds from 0.005 to 0.085 inch is available. All feed changes can be made while the machine is running.

The ram is of the V-type, adjustment being made by a full-length tapered gib, controlled by a single screw. Dirt and grit are prevented from working into the ram bearing through a special construction.

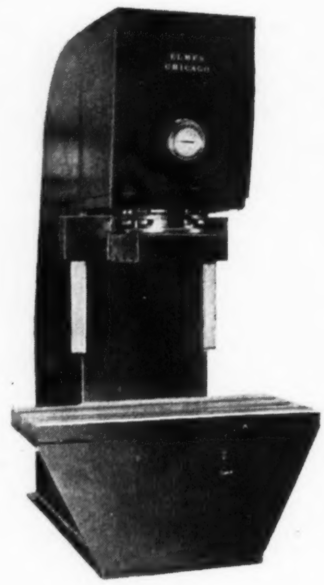
Built-in power rapid traverse to the table is provided on all sizes of shapers. The rapid traverse instantly moves the work up to the tool for the cut, thus reducing the time between cuts. An automatic safeguard prevents damage if the table is run to the extreme end of the cross-rail. The internal transmission provides eight selective speeds covering a wide range. The changes are made by two levers brought within easy reach of the operating position. The crank gear is made in one piece, and has helical cut teeth. 57

Cincinnati 36-inch Rapid-traverse Heavy-duty Shaper

General Electric Plugging Switch

In a new plugging switch for controlling motor stopping, recently introduced by the General Electric Co., Schenectady, N. Y., the use of an Alnico magnet eliminates frictional parts or clutches and contributes to low maintenance costs and long operating life.

In stopping a motor, it is often desirable to reverse the power connection, and so bring the motor to rest quickly through its tendency to run in the reverse direction. This is the method known as plugging. However, if the motor is to stop, it is necessary that the plugging power be removed at the correct moment, to keep the motor from running in the reverse direction. The plugging switch accomplishes this purpose...58



Elmes Open-side Hydraulic Press Built in a Wide Range of Sizes

Elmes Open-Side Hydraulic Press

A general-purpose open-side hydraulic press in which numerous minor improvements have been incorporated has been brought out by the Charles F. Elmes Engineering Works, 222 N. Morgan St., Chicago, Ill. This press is of heavy steel construction, and the pumps, motor, and starter are completely enclosed. The bed is provided with slots for fastening jigs or fixtures, and there are T-slots also in the moving platen, which is accurately guided by adjustable gibs on the frame of the machine.

The control equipment is located within the housing, only the operating levers and motor starter button being exposed. Push-button control can be provided if desired. Operation of the press is controlled by a single lever. Pushing down the lever advances the platen at a high rate of speed, which is slowed down automatically when the work is reached. Releasing the lever reverses the platen, which returns at a considerably higher speed than that at which it descended. The stroke of the moving platen can be easily adjusted to cut down the idle movement.

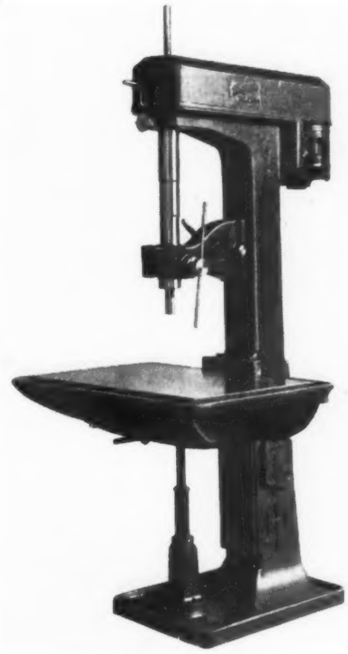
Louvres are provided in the rear of the press for proper ventilation of the motor, and necessary adjustments can be made by opening the hinged cover at the rear of the machine. This press is available in practically any size or capacity desired.........59

To obtain additional information on equipment described on this page, see lower part of page 174.

Demco Sensitive Drilling Machine

The Toledo General Mfg. Co., 3620 Summit Ave., Toledo, Ohio, has recently added a new streamline Model KT vertical-motor Vari-Drive machine to its line of Demco sensitive drilling machines. The drive and speed-changing method employed on this new machine represents a departure from conventional methods, V-belts being employed and an infinite number of spindle speeds being instantly available by simply turning a small crank-handle. A graduated dial directly under this crank-handle indicates the standard group of four to eight speeds of the range available. Various groups of speeds can be furnished, governed by the speed of the motor, from a low of 275 to a maximum of 3400 R.P.M.

The capacity rating of the machine is 7/8 inch. The standard spindle speed range is from 570 to 2280 R.P.M., being changed or adjusted in steps of approximately 18 R.P.M. The overhang is 12 inches, and the single-spindle model has a table with a working surface of 22 by 24 inches. The unit can be furnished in multiple-spindle designs with any number of spindles up to six. Each spindle requires a 1-H.P. standard single-speed motor. Power feed, back-gears, and a reversing motor for tapping are applicable to this model.........60



New Model Demco Drilling Machine

Fig. 1. Watson-Stillman 50-ton Automatic Compression Molding Machine

Watson-Stillman Hydraulic Compression and Injection Molding Machines

The new 50-ton press shown in Fig. 1 is the latest addition to the line of full-automatic hydraulic compression molding machines built by The Watson-Stillman Co., Roselle, N. J. It is designed for molding thermo-setting materials, and is also adapted for handling thermo-plastics. This self-contained, completely equipped machine consists essentially of one vertical and one horizontal cylinder, a hydraulic power unit, and a feed and injector mechanism automatically operated and timed to function in proper sequence. The vertical and horizontal pistons are 11 inches in diameter, and the ram is 8 inches in diameter. The stroke of the vertical and horizontal ram is 12 inches.

All successive operations, from the feeding of loose, granular or preformed material into the hopper to the final ejection of the molded parts and the compressed-air cleaning of the dies, are automatically controlled. The molding cycle is repeated automatically. Control over predetermined quantities of feed, timing, ejection, etc., is positive and safeguarded by special devices.

Flash, semi-positive, positive, or split types of dies can be used. The dies are so mounted that they move out of line while the molded pieces are being ejected. Steam-heated die plates are furnished regularly, but electrically heated plates can be supplied if desired. The double rotary pump is driven by a 7 1/2-H.P., 220-volt, 60-cycle, three-phase motor.

An improved hydraulic injection molding machine for plastics, designated the No. 8-A, has been brought out by the same company. This machine, shown in Fig. 2, has been designed for faster operation and increased capacity, combined with reduced operating and maintenance costs. A distinctive new feature is the zone heat control, which provides for the distribution of heat in such

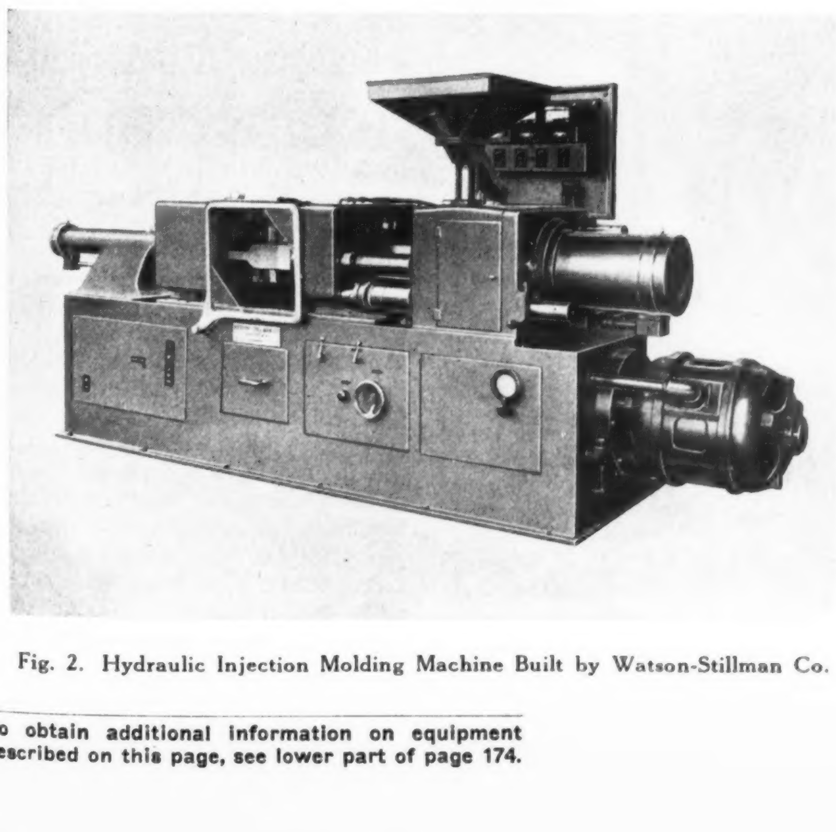
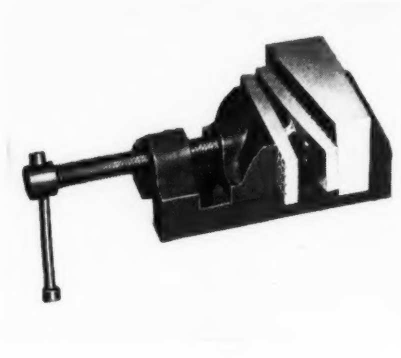


Fig. 2. Hydraulic Injection Molding Machine Built by Watson-Stillman Co.

To obtain additional information on equipment described on this page, see lower part of page 174.

a manner as to give a greater plasticizing capacity to the heating cylinder. The smooth uniform bore of the cylinder offers no place for material to lodge in and facilitates changing molding operations from one color plastic to another.

The 24-inch opening between die plates, with an adjustment of 18 inches on the clamping end, makes it possible to accommodate dies 6 inches thick and up. The toggle clamping device affords positive clamping for dies having projected areas up to 125 square inches. Two material cylinders are available for use with this machine. The maximum weight of material injected per cycle with the 2 3/16-inch cylinder is 6 ounces, at a pressure of 50,000 pounds per square inch. With the 2 3/4-inch cylinder, the maximum weight is 8 ounces, at a pressure of 32,000 pounds per square inch. The machine is arranged for full-automatic, automatic single-cycle or hand control. 61



Machine Vise Equipped with "Equi-Hold" Self-adjusting Jaw

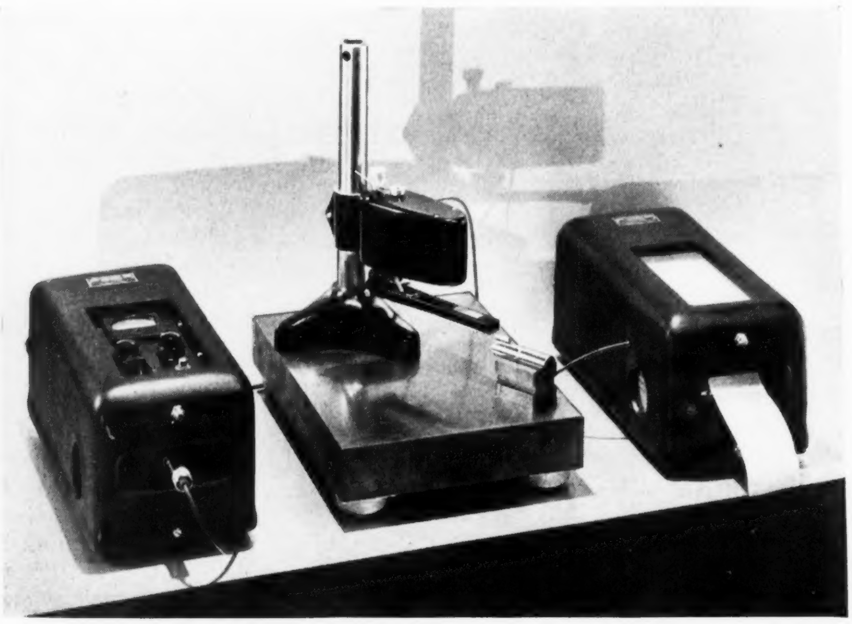
Brush Surface Analyzer for Determining Smoothness of Finished Surfaces

The Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio, has brought out a surface analyzer, designed to record irregularities in finished surfaces, such as obtained on metal parts by grinding, honing, lapping, and superfinishing operations. The instrument records the amplitude, as well as the number, of irregularities within a certain area, and at the same time, indicates whether they are above or below the normal bearing surface. Absolute measurements are shown without resorting to conversion formulas, and values, in fractions of microinches, can be easily determined.

This method of recording the smoothness or "topography" of a finished surface is accomplished by a finely polished sapphire stylus, which passes over the surface to be analyzed. The irregularities in a finished surface displace the stylus, which, in turn, actuates a piezo crystal element. The minute voltages generated by the crystal are magnified by an amplifier, which provides sufficient voltage for operating a direct-inking oscillograph.

The oscillograph includes a piezo electric crystal element which converts this voltage into a movement that actuates the recording pen. These deflections, recorded in ink on a moving paper chart, are directly proportional to the movements of the stylus on the specimen surface, but are magnified as much as one hundred thousand times.

The surface analyzer includes the analyzing head, amplifier, direct-inking oscillograph, and surface plate. These units may be set up in the shop or laboratory and placed in operation by simply plugging into 110- to 220-volt, 60-cycle, alternating current. 62



Equipment Brought out by the Brush Development Co., for Recording the Smoothness of Finished Surfaces

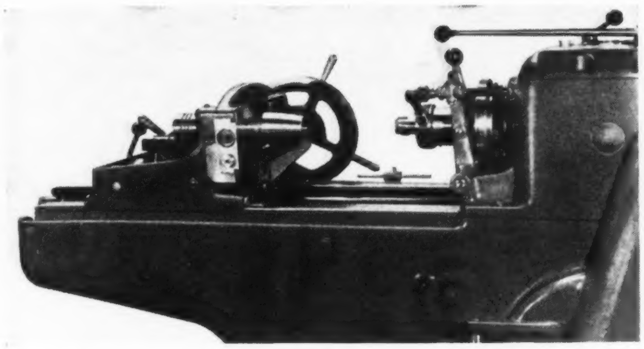
"Equi-Hold" Self-Adjusting Device for Machine Vise Jaws

The F. & H. Mfg. Co., 6024 Ellery St., Detroit, Mich., has brought out a device designated the "Equi-Hold" intended for use with a machine vise, as shown in the accompanying illustration. This device is expressly designed for the instantaneous clamping of a work-piece whose opposite sides do not lie in parallel planes. It consists of two serrated plates, the backs of which are connected by a ball-and-socket joint held together by a spring. One of the plates is provided with adjustable, hardened set-screws having a tapered center point designed to increase the frictional engagement with either the vise jaw or the work-piece. The "Equi-Hold" is made in four standard sizes, as follows: 1 1/4 by 1 1/4 inches; 1 1/4 by 3 inches; 2 3/8 by 2 3/8 inches; and 1 3/4 by 6 inches. 63

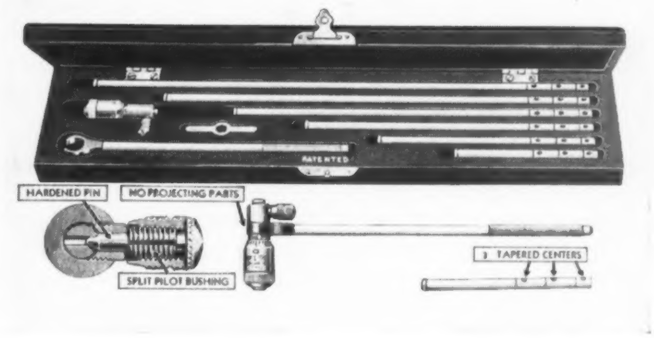
"No-Kik" Welding Cable

A new type "all-in-one" welding cable employing a unique method of neutralizing induction to eliminate "cable kicking" has been brought out by the Progressive Welder Co., 3024 E. Outer Drive, Detroit, Mich. This new cable, known as the "No-Kik," is designed to permit the welding gun to be handled with greater ease and speed. The welding current cables, water cooling lines, and control cable are all sheathed in a single, seamless rubber covering of maximum flexibility, which is said to minimize cable wear. These units are designed especially for use with the company's welding guns and transformers, but can be supplied with special adapters for any gun type welder-transformer combination. 64

To obtain additional information on equipment described on this page, see lower part of page 174.



Landmaco Equipped for Tapping Operation on 75-millimeter Shell



"International" Inside Micrometers Packed in a Hard-wood Case

Landmaco Threading Machine Equipped for Tapping Shells

An entirely new application for the Landmaco threading machine, manufactured by the Landis Machine Co., Inc., Waynesboro, Pa., is shown in the accompanying illustration. Although this threading machine is designed primarily for cutting external threads, the illustration shows it equipped with a Landis Style ALT collapsible tap for cutting internal threads on the fuse-plug end of a shell. While the illustration shows a 75-millimeter shell in the fixture, the machine will handle shells of other sizes.

In addition to substituting the collapsible tap for the usual Lanco head, special accessories—including a gage arm, round grips, and a work-supporting cradle—are employed in the set-up shown. The gage arm projects beyond the front of the carriage and provides a definite stop for locating the work accurately, so that the thread can be cut up to a shoulder without breaking the tap chasers. The special round grips employed to assure correct alignment of the work have wide faces and are ground to conform to the diameter of the work. The entire carriage front can be adjusted both vertically and horizontally, so that the grips can be aligned very accurately, as required to insure a high degree of thread concentricity.

In operating the machine, the work is placed on the cradle and pushed forward through the grips to the stop. The ground surface of the cradle prevents the surface of the work from being marred. The grips are then closed on the work and the lead-screw engaged. When the thread has been tapped to the predetermined length, the tap automatically collapses, so that the work can be withdrawn. This arrangement permits tapping the shell threads well within the specifications for this class of work and at a high production rate.

The chamber at the end of the shell that forms the seating surface for the fuse plug can also be machined by incorporating a set of milling cutters in the tap in back of the regular chasers. With this arrangement, the shell is run up against the milling cutters, the tap being in the collapsed position. After the surface is milled, the work is withdrawn and the tap expanded for tapping the thread in the regular manner. 65

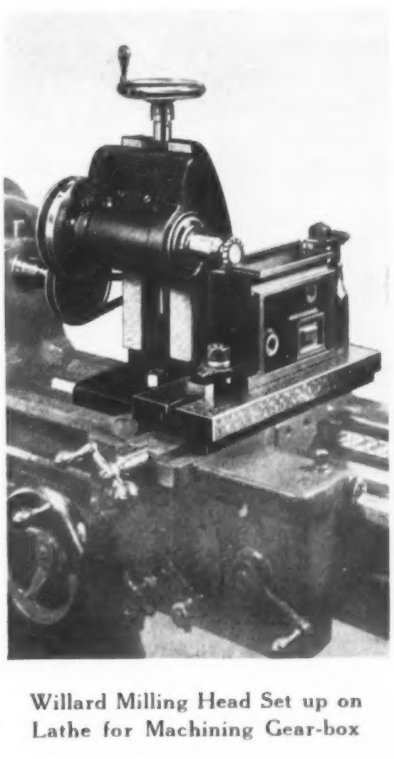
"International" Inside Micrometers

A new type of inside micrometer with several improved features is being placed on the market by the Pacific Specialty Supply Co., 344 N. Vermont Ave., Los Angeles, Calif. The outstanding feature of this new micrometer, known as the "International," is the method of locating the measuring rods, which permits quick setting. Each rod is marked with its length and held to the head by a locating screw, which is threaded into a center on the rod. The centers can be easily located by means of lines on the rods. The locating screw has a hardened tool-steel point, and is locked in position by a split pilot bushing.

All rods have three centers which are accurately spaced 1/2 inch apart, giving an adjustment range of 1 1/2 inches for each rod. The extra long extension handle can be quickly attached to the micrometer head. It is slipped on the head on the opposite side of the locating screw, and is then swung around to the front, so that the micrometer can be used in blind holes. By simply turning the handle, a brass plug is forced against the micrometer, locking the handle in place. These micrometers are made in two sets, with capacity ranges of 1 1/2 to 6 inches and 1 1/2 to 12 inches. 66

Willard Milling Head for Lathes

A milling head that can be easily attached to a lathe and is capable of performing a large variety of milling operations has been brought out by the Willard Mfg. Co., 6527 Second Ave., Los Angeles, Calif. This attachment can be completely set up ready for work in less than three minutes. The spindle has a vertical travel up to 6 inches above the table, depending on the make and model of the lathe on which it is used. The 4 1/2- by 12-inch table is provided



Willard Milling Head Set up on Lathe for Machining Gear-box

To obtain additional information on equipment described on this page, see lower part of page 174.

with a 1/2-inch T-slot, and has a longitudinal travel up to 7 inches, which can be increased to 10 inches by employing a special cross-feed screw. The spindle has a No. 9 B & S taper.

The attachment is shown in the illustration set up for machining a cast-iron gear-box, which is clamped to the table. All slotting, facing, drilling, and tapping operations are done in one setting, thereby insuring accurate alignment. A long milling arbor and outboard support (not shown) can be used for work requiring several cutters. The outer bearing of this support automatically aligns itself with the vertical travel of the milling spindle and arbor.

Castings that are too large to swing in the lathe can be faced and bored on the milling head when it is equipped with a chuck adapter. With this arrangement, the lathe cross-slide is mounted on a raising block secured to the attachment table.....67

Kent-Owens Milling Machine Designed to Handle Long Work

A new milling machine with a horizontal spindle and vertical feed to the head, which is especially suitable for milling Woodruff keyways and performing similar operations on long parts, has been brought out by the Kent-Owens Machine Co., Toledo, Ohio. An extra long table furnishes adequate support for the work throughout its entire length. Several Woodruff keyways are milled in alignment with each other in the shaft shown on the machine table. The shaft rests in V-blocks and against a stop at one end, a clamp being provided to hold it securely.

The table is advanced lengthwise through a rack and pinion by means of the large handwheel. Dogs on the table position the work for cutting each successive keyway. After the work has been set for a given keyway, the vertical movement of the head is entirely automatic. This movement is obtained hydraulically, and adjustable dogs permit any desired combination of rapid traverse and feed within the limits of the machine. The operator simply depresses the starting lever, after which the cutter is rapidly lowered to the work, and the work is then milled at the proper feed rate. When the proper depth is reached, the feed is automatically reversed, and the cutter returned to the upper position. This cycle is repeated as the table is advanced for cutting each keyway.

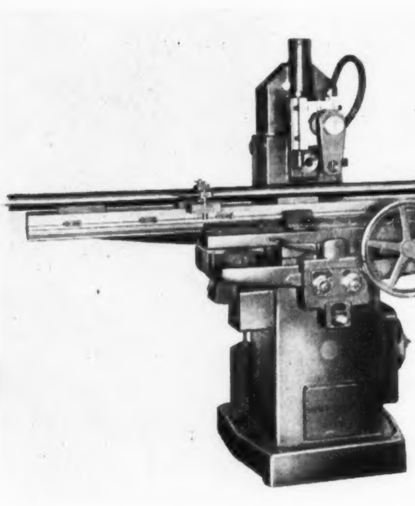
The drive is through a ball-bearing motor mounted at the rear of the machine. Pick-off gears provide a range of spindle speeds from 100 to 1335 R.P.M., with a 1200-R.P.M. motor. With the hydraulic actuation of the head, an infinitely variable feed rate ranging from 3/4 inch to 80 inches per minute can be obtained, together with a constant rapid travel rate of 300 inches per minute. Changes in the feeding rate are obtained by simply adjusting the dials at the front of the machine. In the set-up illustrated, a special automatic clamping member is mounted on the over-arm..........68

Noble & Westbrook Rapid Precision Marking Machine

The Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn., has recently developed a horizontal dial type, rapid precision marking machine for marking permanent inscriptions on work-pieces that can be placed on end, such as bushings, socket wrenches, spark plug shells, small explosive shells, and similar parts. Work-pieces marked by this particular machine — the Model No. 98—should have sufficient wall thickness to withstand the marking pressure. Pieces up to 6 inches in diameter can be marked by using pressure dials of the proper size.

Both the pressure dial and the die-holder have vertical adjustments that permit the work to be marked at any distance from the end up to 1 1/4 inches. The die-holder has a lateral adjustment that enables the same pressure dial to be used for work of various sizes. An unloading device provides for ejecting the work.

The machine is motor-driven. Production varies with the type and size of work from approximately 40 up to 100 pieces per minute. The machine requires a floor space of 30 by 20 inches, and weighs approximately 800 pounds..........69



Kent-Owens Milling Machine with Table Designed for Long Work

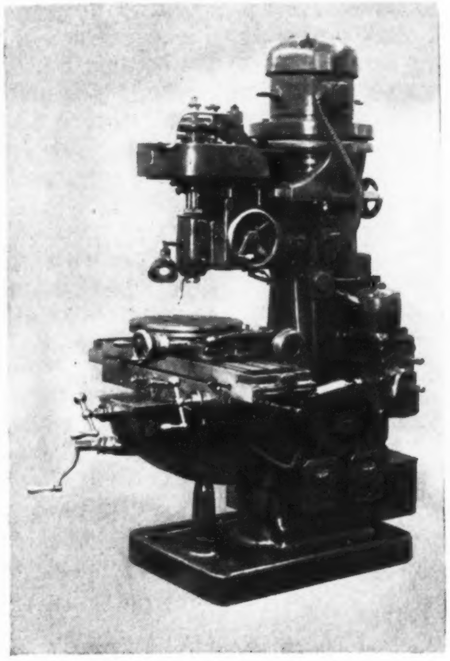
Rapid Precision Marking Machine

Electric Heating of Large Nitrate Baths for Heat-Treatment

The Ajax-Hultgren heating principle, now widely used in salt baths for carburizing, hardening, and the treatment of high-speed steel tools, has been commercially applied to large nitrate baths for the heat-treatment of aluminum alloys by the Ajax Electric Co., Inc., 953 Frankford Ave., Philadelphia, Pa.

In this equipment, the provision of three pairs of electrodes eliminates the need of other heating elements, since the heat is generated directly in the salt bath by virtue of its resistance to the flow of current between the narrow electrode gaps. The electrodes are so arranged and proportioned as to produce an automatic circulation of the bath by means of electro-magnetic forces generated at the electrodes. This patented operating principle assures great uniformity of temperatures throughout the bath. The working temperatures of the furnace range from 450 to 1100 degrees F..........70

To obtain additional information on equipment described on this page, see lower part of page 174.



Back-geared Milling and Die-sinking Machine Brought out by the Reed-Prentice Corporation

Porter-Cable Abrasive-belt Grinder Equipped for Wet or Dry Grinding

Reed-Prentice Back-Geared Vertical Milling and Die-Sinking Machine

The Reed-Prentice Corporation, Worcester, Mass., is introducing to the trade a No. 3VG vertical milling and die-sinking machine in which a back-gear spindle construction has been incorporated. This new machine will supersede the No. 3V model previously built by the company.

A new design of auxiliary bracket is used for the back-gear assembly, which is employed to obtain slower spindle speeds than can be secured with the direct belt drive. The speeds obtained with a 900-R.P.M. motor using a direct belt drive range from 300 to 2000 R.P.M. With the back-gears, speeds ranging from 100 to 270 R.P.M. can be obtained. With a 1500-R.P.M. motor, the direct belt speeds range from 495 to 3300 R.P.M., and with the back-gears the range is from 165 to 400 R.P.M. Intermediate speed ranges are obtained by employing either a 1000-R.P.M. or a 1200-R.P.M. motor. The back-gear assembly can be omitted when it is not required. 71

Porter-Cable Abrasive-Belt Grinder

A new heavy-duty abrasive-belt grinder equipped for dry or wet grinding is being placed on the market by the Porter-Cable Machine Co., 1714 N. Salina St., Syracuse, N. Y. This new Type G-8 grinder provides a variety of speeds, from 2400 to 6000 feet per minute, for grinding metals, plastics, ceramics, glass, rubber, etc. It is adapted for squaring, cleaning, boring, facing, and polishing, as well as for removing gates and flashing.

An exceptionally long belt, 9 feet in circumference by 8 or 9 inches wide, is employed to reduce heat and give economical service. The machine is built for heavy duty, with large pulleys and heavy-duty special sealed bearings. 73

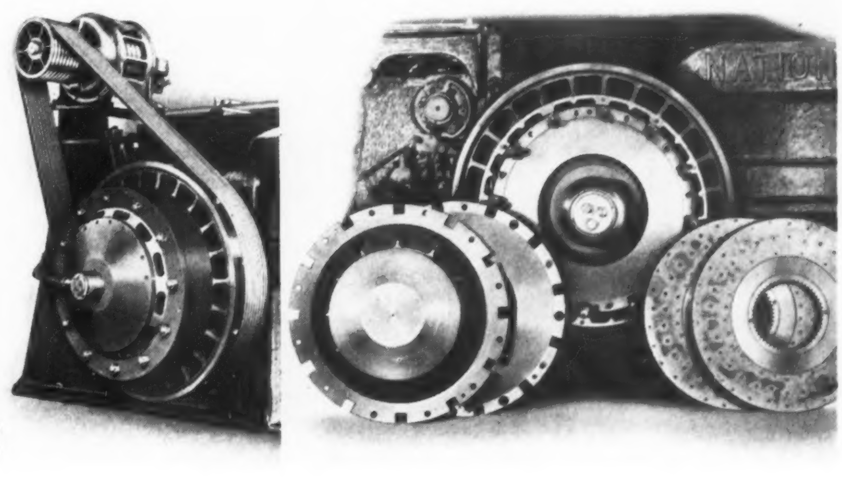
Live Center with Interchangeable Inserts

The Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill., is placing on the market a new live center with three interchangeable inserts. One insert is a male center, intended for work that is already centered; another is a female center for plain work; while the third is a female center with three raised lands, for use on uncentered work, such as armatures, drills, etc. The inserts can be quickly removed by a knock-out screw. This center equipment is adapted for a large variety of centered and uncentered work, and is intended for use on all types of machine tools, including lathes, milling machines, grinders, etc. 72

Simplified Air-Cooled Clutch for Heavy-Duty Work

The National Machinery Co., Tiffin, Ohio, has developed a line of improved heavy-duty friction clutches. The view at the left in the illustration shows a National 4-inch high-duty forging machine equipped with this new type clutch. For convenience in servicing, the piston and gasket are so arranged that they can be easily removed.

The leather gasket on the operating piston can be replaced by merely removing the piston-head. The view to the right in the illustration shows all the driving and driven plates and the driving pinion removed for inspection or repair without removing



Air-cooled Clutch of Simplified Design Employed on National High-duty Forging Press

To obtain additional information on equipment described on this page, see lower part of page 174.

the flywheel or disturbing the adjustment of either of its bearings. Notwithstanding the unusually large size of the clutch plates, the centralized location of the piston insures an equalized pressure over the clutch faces, so that maximum torque is obtained, and slipping and heating of the clutch is reduced to a minimum. The air pressure applied directly over the center of the piston gives instantaneous piston action, thus reducing the drag on the clutch.

A suction fan cooling system dissipates any heat developed. The air-cooling system is so aranged that none of the air can circulate between the plates, thus preventing dust from being deposited on the friction surfaces of the clutch. This new clutch is available in all sizes required for the National high-duty forging machines and Maxipresses, and it can also be supplied in various designs to suit the requirements of other machines. 74

Welding Blowpipe and Cutting Attachment

A new medium-pressure oxy-acetylene blowpipe for welding light-gage metal, and a cutting attachment for cutting iron and steel up to 1 inch in thickness, have been placed on the market by The Linde Air Products Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York City. The welding blowpipe, known as the Prest-O-Weld, Type W-109, is especially designed for welding light production work in aircraft construction. Its field of usefulness includes, however, all applications in which metals up to 3/8 inch thick are to be joined by welding. Tests have shown it to be equally well adapted for sheet-metal welding, such as automobile fender and body work. Eight different sizes of welding heads, each with an individual mixer, are available.

The Prest-O-Weld, Type CW-109, cutting attachment, for cutting sheet metal and light plate up to 1 inch thick, is attached directly to the blowpipe handle in place of the welding head. This attachment has an improved cutting valve with rubber-seated stem, and a cutting valve lever that can be turned back 90 degrees to permit access to the cutting valve assembly and for easy connection to and disconnection from the blowpipe handle. Two cutting nozzles are supplied, the No. 0 for cutting iron and steel up to 1/4 inch thick, and the No. 1 for cutting material up to 1 inch thick. 75

Load Lifter Jr. Electric Hoists

The Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich., has added two new hoists to the Load Lifter Jr. line. The new lifters have capacities of 500 and 1000 pounds. These hoists are of the low head-room type, built for heavy-duty service, and of wire rope and drum design.

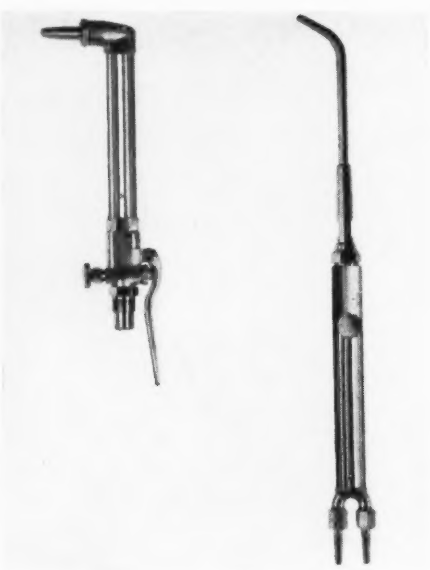
On both sizes, the hook, when in its highest position, is within 12 1/4 inches of the beam on which it travels. The hoists are available in lug suspension types for bolting in place, hook suspension types for hanging in position, and combined with a push type ball-bearing trolley for operating on either I-beams or special monorail tracks.

Outstanding features are light weight, the hoist complete with trolley weighing but 180 pounds; forged-steel gearing; standard Shaw-Box two-gear reduction drive; and the provision of ball bearings throughout. Pendent cord or push-button control is furnished, as desired. Either single-phase or polyphase alternating current can be used. 76

Clamping Tools Developed for Use in Aircraft Industry

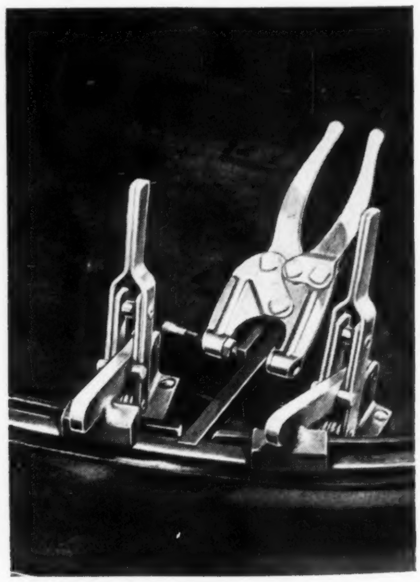
The Detroit Stamping Co., Detroit, Mich., has developed two new clamping tools, both of which are designed especially for use in the aircraft industry. However, these clamps can be profitably employed for clamping and holding many other types of work in production plants. They are especially adapted for use where limited clamping space or the nature of the work makes it impossible to use larger clamps.

Rapid-action De-Sta-Co toggle clamp No. 220, aviation model, of which two are shown in the illustration, measures but 1 29/32 by 1 5/8 inches at the base. This device is designed for quick clamping, positive holding, and instant release. Raising the operating handle exerts a clamping pressure in the ratio of 33 to 1.



Linde Oxy-acetylene Welding Blowpipe and Cutting Attachment

Load Lifter Jr. Electric Hoist Built in 500- and 1000-pound Capacities



Clamping Devices Developed by the Detroit Stamping Co.

To obtain additional information on equipment described on this page, see lower part of page 174.

The rapid, light-duty, No. 460 toggle pliers, shown in the center of the illustration, measure but 6 15/32 inches in length. A lock-nut permits rapid adjustment of the clamping head spacing from 0 to 11/16 inch to accommodate work of various thicknesses. Closing the handles of these pliers exerts pressure on the work in the ratio of 75 to 1 at the clamping end of the pliers. 77

Energizer for Magnetic Chucks

An efficient means of energizing magnetic chucks without the use of a generator has been developed by the Sturdy Tool & Engineering Co., 14520 Shaefer Highway, Detroit, Mich. This unit provides full-capacity output for chucks up to 6 by 18 inches in size or with a 1-ampere load. The possibility of failure is reduced to a minimum through the use of a heavy-duty transformer and four rectifier tubes. If one, two, or even three of the tubes should fail, the work-piece will not be released from the surface of the chuck. A pilot light shows when the unit is in use. The unit is self-contained, with the magnetizing and reversing switch mounted on the front panel. 78

Lee Duplex Welder

The K. O. Lee & Son Co., Aberdeen, S. D., has placed on the market a new heavy-duty welder of 500-ampere capacity known as the "Duplex." It is made up of two of this company's Model W250 welders, coupled together in series and mounted on a truck with a junction box. Each welder has a capacity of 250 amperes, giving the equipment a total welding capacity of 500 amperes. The truck enables the welder to be readily wheeled over rough floors and to any part of the shop.

The welder is designed to operate on either 220 or 440 volts, and has a welding range of 20 to 500 amperes. It will handle electrodes from 1/16 to 3/8 inch in diameter, and will weld material such as that used for the thinnest automobile fenders, as well as the heaviest castings and steel sections. 79

Petermann Automatic Screw Machine

The latest type of automatic screw machine made by Jos. Petermann, Moutier, Switzerland, is being placed on the American market by Russell, Holbrook & Henderson, Inc., 99 Hudson St., New York City. This machine—the Model P7—has a capacity of 0.280 inch, or 0.360 inch when equipped with an over-size spindle. A feature of this machine is the provision of work feed for the headstock, the work being fed by the headstock through a bushing that can be revolved or allowed to remain stationary as preferred. The five slide tools always work directly at or a few thousandths inch from the supporting bushing.

One of the five tool-slides can be removed and replaced with a slotting or cross-drilling attachment. The tools are successively fed into the work by means of cams, in coordination with the lead or headstock feed cam, thus generating the required form with tools that can be easily ground. The tools have micrometer adjustments in three directions. The toolposts are designed to permit the use of carbide tools. Pick-off gears provide seventeen changes of speed. There are fifty-eight different cam-shaft speeds available for each spindle speed.

The standard machine has a spindle speed range of 1800 to 10,000 R.P.M., and the slow-speed machine has a range of 1200 to 7000 R.P.M. Attachments can be supplied for centering, drilling, and threading by reversing die or opening die, screw-head slotting, cross-hole drilling, etc. Threading operations are performed by over-running, that is, by driving the tap or die in the same direction but faster than the work 80

Protective Hood for Industrial Workers

Protection of workmen against silicosis and other occupational diseases caused by the inhalation of dust or fumes is offered by a light hood placed on the market by the Jackson Electrode Holder Co., Detroit, Mich. This hood is made from black rubberized fabric, and fits the shoulders of the worker. It permits clear vision, being provided with a Plastacele window, and at the same time, gives protection to the eyes and face. 81

Duplex Welding Equipment Mounted on Truck, Built by K. O. Lee & Son Co.

Petermann Automatic Screw Machine with Headstock Equipped to Feed Work

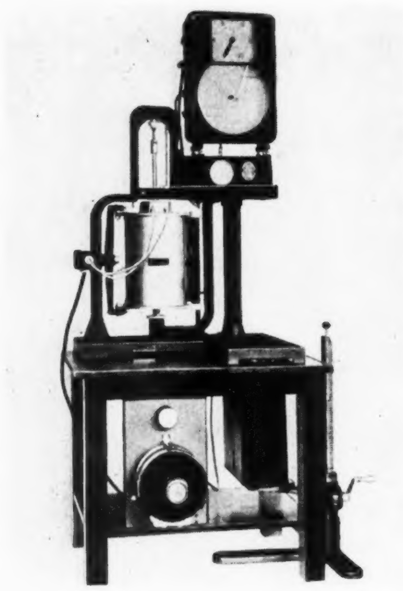
To obtain additional information on equipment described on this page, see lower part of page 174.

New Master Copy Type for Engraving Machines

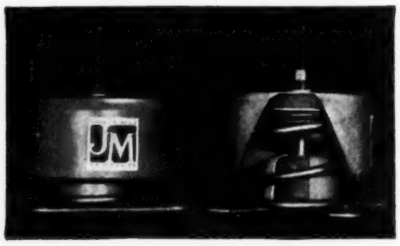
Master letters or copy type made of durable plastic material for three-dimensional pantographic engraving and die-cutting machines is being placed on the market by the H. P. Preis Engraving Machine Co., 157 Summit St., Newark, N. J. This new type is intended for use in producing steel letter stamps, type, and various classes of dies. It is furnished in heights of 5/32, 1/4, and 1/2 inch, and in eight different widths. The face of the character is formed with a double bevel, the lower being 20 degrees from the center line and the upper 35 degrees. This arrangement permits very close spacing. A stud projecting from the back of the character facilitates lining up. 82

Rockwell-Bristol Dilatometer

A new dilatometer, designed by Stanley P. Rockwell, Hartford, Conn., is being placed on the market by the Bristol Co., Waterbury, Conn. This dilatometer, known as the Model RB, is a direct-reading instrument which both indicates and records in ink time-dilation and temperature-dilation changes simultaneously during heating and cooling cycles of ferrous and non-ferrous metals and other materials. The temperatures are recorded on a Bristol Pyromaster potentiometric 12-inch round chart, and the time element is recorded by a separate pen through a Telechron clock. 83



Dilatometer that Records Time and Temperature Changes Simultaneously



Machine Vibration Isolator Developed by Johns-Manville

Johns-Manville Machine-Vibration Isolator

An easily installed vibration isolator, designed to control machine vibration, reduce noise, and prevent cracking of supporting walls and floors, has been developed by Johns-Manville, 22 E. 40th St., New York City. This device, known as the J-M controlled spring isolator, is intended for use on the bases of motors, generators, pumps, ventilating fans, and similar equipment.

The working parts consist of a coil spring and a rubber load pad, which support the equipment and isolate vibration, and an adjustable rubber snubber inside the base, as shown in the cut-away view, which controls excessive motion. The isolator is built to take care of horizontal and torsional, as well as vertical vibration. It is made in a light-duty size for loads from 60 to 190 pounds per isolator; and in a heavy-duty size for loads from 250 to 720 pounds per isolator. Heavy machines can be isolated by using clusters of the units. The loaded over-all dimensions of the isolator are 6 by 6 by 3 3/4 inches. A metal jacket protects the rubber parts from oil and light. 84

Light-Weight Riveting Hammer

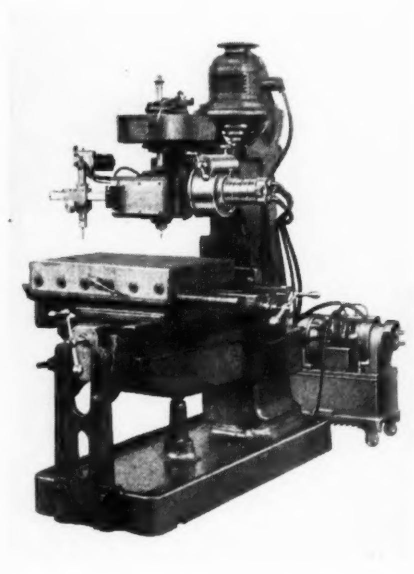
The Ingersoll-Rand Co., 11 Broadway, New York City, is placing on the market a new light-weight, air-operated riveting hammer known as the Model AV, which is designed for use in the fabrication of iron, steel, and aluminum products. This hammer is available in two types—a short-stroke, fast-hitting model for ordinary use, and a long-stroke, slow-hitting type designed primarily for aluminum, dural, or soft iron rivets. Both types can be furnished with either a pistol grip, an offset, or push-button handle. These tools can be used for extra light chipping, scaling, and calking work when equipped with the proper chisels. 85

Improved Duplicator for Die and Mold Production

Greater accuracy and faster production in the duplicating of dies, molds, etc., are important advantages claimed for a new low-cost, duplicating control and drive mechanism brought out by the Detroit Universal Duplicator Co., 237 St. Aubin St., Detroit, Mich. The extreme sensitivity of control necessary for this kind of work is provided through a new auxiliary drive and an improved design of the Detroit Universal duplicator, in which a superimposed impulse mechanism is included. This duplicator can be used either to actuate the table feed, or—through the new auxiliary control—to actuate the head feed of vertical milling machines, the latter method giving the highest degree of accuracy.

The head feed control is an independent unit that is applicable to a wide variety of machine tools, such as lathes, shapers, planers, boring mills, etc., and is so designed that it does not interfere with the use of the machine when the duplicating control is not required.

The improved electrical control system governs the impulses to the feed drive so efficiently that the accuracy of most types of work can be held within 0.0015 inch. As the tracer follows the templet a series of electrical contacts is made, each immediately broken by a cam-operated contact point. Each time contact is made one of two solenoids is actuated, which, in turn, controls the "up" or "down" position of a hydraulic valve plunger. The change in position of



Milling Machine Equipped with Drive Control for Producing Duplicate Dies

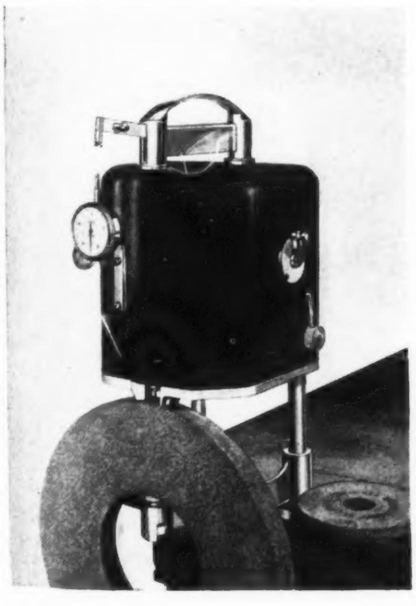
To obtain additional information on equipment described on this page, see lower part of page 174.

the plunger diverts fluid, under pressure from the hydraulic pump, into either of two flexible hydraulic supply lines connected with the hydraulic feed motor of the new drive. Even when the tracer is following a section of the pattern requiring no feed, electrical contacts continue. However, these impulses are of such short duration and made in such rapid sequence that they neutralize each other, with the result that practically no motion is transmitted to the machine tool. 86

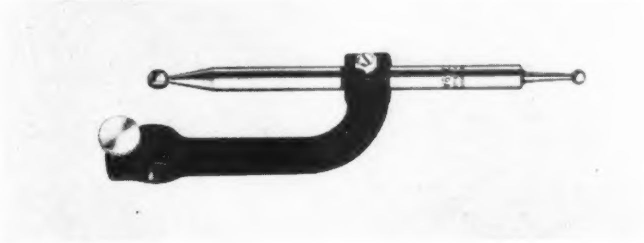
Portable Grade-O-Meter for Determining Correct Grade of Grinding Wheels

A portable instrument weighing only 28 pounds, known as the Type P Grade-O-Meter, has been developed by the Abrasive Engineering Corporation, 15947 Turner Ave., Detroit, Mich., for grinding wheel users. This instrument will accurately grade grinding wheels of practically any size, and is calibrated with the larger Type L Grade-O-Meter made by the company.

By employing this instrument, the proper grade and the limit of grade tolerance for grinding operations can be determined, thus enabling the user to select the most efficient wheels for all kinds of grinding work. 87



Portable Grade-O-Meter Developed by Abrasive Engineering Corporation



Brown & Sharpe Hole Testing Attachment for Dial Test Indicator

B & S Attachments for Dial Test Indicators

The Brown & Sharpe Mfg. Co., Providence, R. I., has recently added to its line of machinists' tools two new hole testing attachments, the No. 729C and the No. 729D, for use on dial test indicators having stems 0.375 inch in diameter. These attachments adapt the indicators for testing internal and other surfaces that cannot be reached with the spindle of the dial gage. An adjustable fulcrum screw is provided that serves to take up any looseness or play in the arm.

Hole attachment No. 729C is suitable for use in deep holes, and will enter a hole to a depth of 1 11/16 inches, while hole attachment No. 729D, which is similar, has a shorter arm and is suited for use in shallow holes or for rough-grinding and boring operations, as with the shorter arm the tendency to chatter is reduced. The arm of the No. 729D attachment will enter a hole to a depth of 13/16 inch. The arms of both attachments are 7/32 inch in diameter, and are hardened. 88

Lincoln Hard-Facing Electrodes

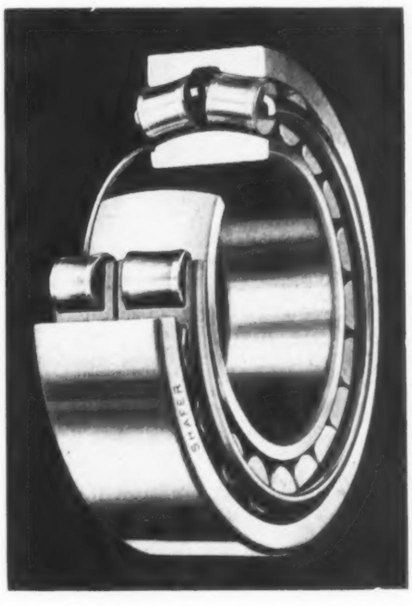
The Lincoln Electric Co., Cleveland, Ohio, has developed two new hard-facing electrodes, known as "Faceweld No. 1" and "Faceweld No. 12." Faceweld No. 1 is a general-purpose, hard-facing electrode and is the softer and tougher of the "facewelds." It has good abrasion resistance, very high resistance to impact for this class of material, and is used for surfacing such parts as digger teeth, grader blades, cement plant machinery, etc., by welding. The single-layer hardness is approximately 45 to 52 Rockwell C, and the multiple-layer hardness is about 52 to 58 Rockwell C.

"Faceweld No. 12" is applied by arc welding. It is somewhat harder than "Faceweld No. 1" and has superior resistance to abrasion. Its resistance to impact is excellent, but not quite so high as that of "Faceweld No. 1." Applications include screw conveyors, conveyor sleeves, plows, crushers, power shovels, pump impellers, coal pulverizer jaws, and cement mill machinery. The single-layer hardness is approximately 52 to 57 Rockwell C, and the multiple-layer hardness 55 to 59 Rockwell C. 89

Shafer Self-Contained Double-Row Roller Bearings

The Shafer Bearing Corporation, 35 E. Wacker Drive, Chicago, Ill., has placed on the market a new type of double-row roller bearing that is available in DE 200 series with bores ranging from 3.1490 to 5.9045 inches in diameter; and in DE 300 series with bores ranging from 1.9680 to 5.1171 inches in diameter. These new series bearings are of the self-contained, double-row, angular-contact type. The concave rollers operate between convex races, the one-piece outer race having two ground raceways.

This design permits self-alignment and insures free rolling action under shaft deflection or misalignment. It enables radial loads, thrust load in either direction, or any combination of these loads to be carried. 90

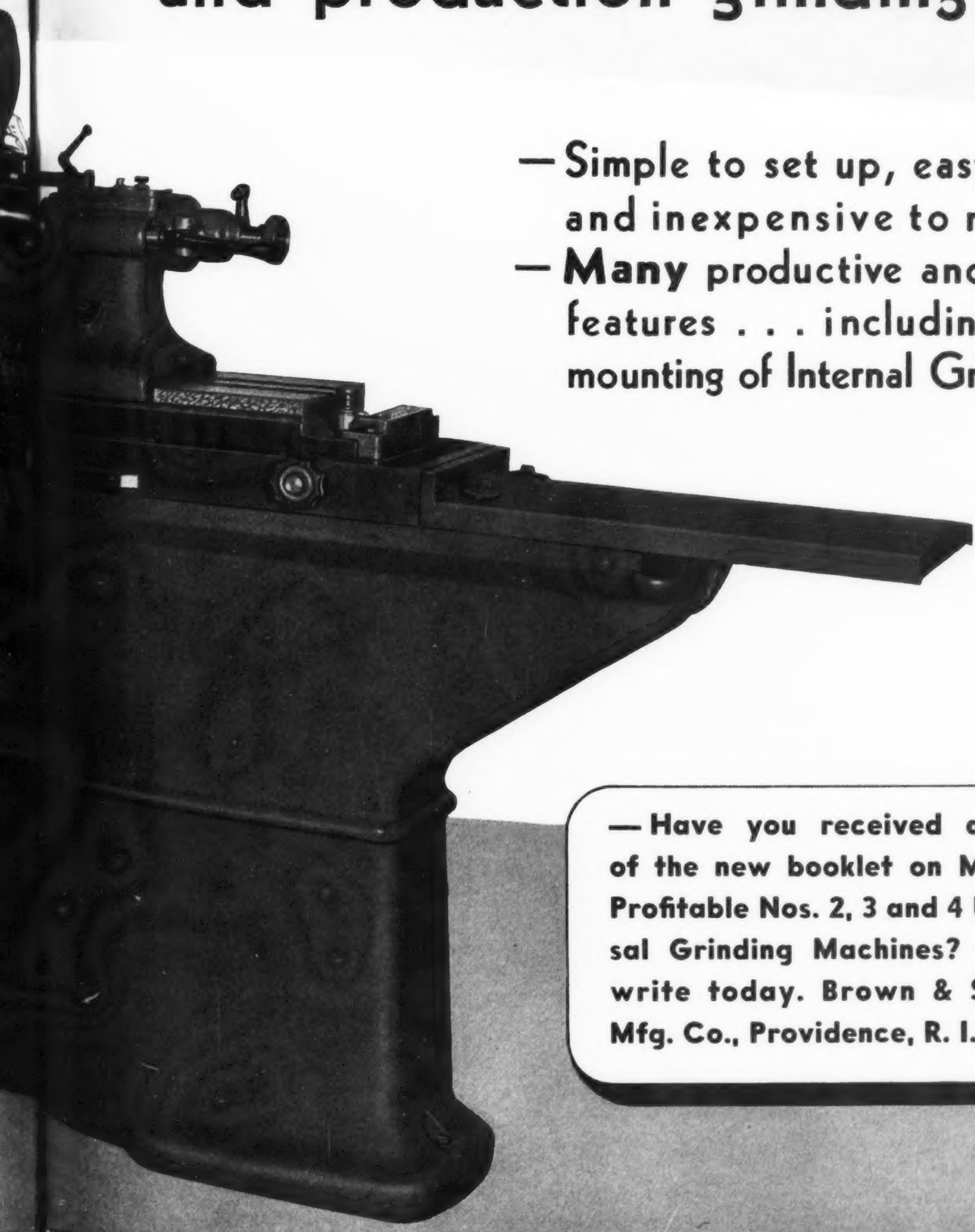


Double-row Roller Bearing Made by the Shafer Bearing Corporation

To obtain additional information on equipment described on this page, see lower part of page 174.

MODERN UNIVERSALS

. . . for a wide variety of toolroom and production grinding

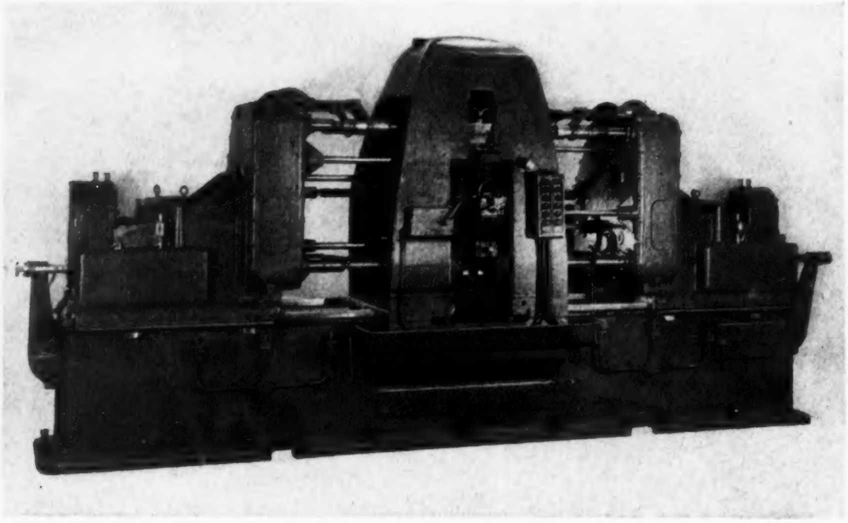


— Simple to set up, easy to operate and inexpensive to maintain

— **Many** productive and cost-saving features . . . including permanent mounting of Internal Grinding Fixture

— Have you received a copy of the new booklet on Modern, Profitable Nos. 2, 3 and 4 Universal Grinding Machines? If not, write today. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.

SHARPE



Two-way Horizontal Drilling, Boring, and Reaming Machine Developed by the LeMaire Tool & Mfg. Co.

LeMaire Two-Way Horizontal Drilling, Boring, and Reaming Machine

The LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., has recently developed a two-way horizontal machine known as the No. 60 Standard, which is intended for performing drilling, boring, and reaming operations from two directions.

The machine illustrated performs five operations at one time on both forks of a universal joint yoke, boring the holes in perfect alignment. The operations are center-drilling, drilling, core-drilling, rough-boring, and finish-boring. The pieces are clamped in separate fixtures, of which there are six, secured to a six-station indexing turret. One completed piece is produced for each cycle of operations.

The principal feature of this machine is the use of standardized slide type power units which contain all the power elements, such as the driving motor, hydraulic feed pump, and control valves, as well as the feed cylinder, which is secured to the unit. These standardized slides can be adapted to different types of machines.

The hydraulic devices used are designed and built by the LeMaire company. Provision has been made for speed changes by means of pick-off gears that are easily accessible at the rear end of the slides. Another feature is the use of separate precision boring spindles which are independent of the machine spindles and are piloted through long, hardened-steel bushings in the fixture. In this manner, the precision boring spindles are held in perfect alignment in the fixture. 91

Cutler-Hammer Heavy-Duty Direct-Current Contactors

A new, high efficiency type arc blow-out, which instantly ruptures the arc on the arc horns instead of on the contacts, thus greatly prolonging contact life, is a feature of the 540 line of direct-current, heavy-duty contactors recently added to the line of electric motor control equipment made by Cutler-Hammer Inc., 315 N. 12th St., Milwaukee, Wis. These new contactors are available in 100-, 150-, 300-, 600-, 1200-, and 1800-ampere sizes. Another feature of this contactor is the electric interlock. Contact troubles are eliminated by the "dust-safe" vertical contact construction of this device. Pure silver contacts are employed which are impervious to sulphur fumes and oxidation. 92

"Magne-Blox" Parallels and V-Blocks for Magnetic Chucks

Small Size Precision Ball Bearings with Retainers

The precision ball bearings of diminutive size with bores as small as 1/8 inch previously made by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., in the retainerless type are now available with retainers or ball cages. These bearings include sizes with bores of 1/8, 3/16, and 1/4 inch; outside diameters of 3/8, 1/2, and 5/8 inch; and widths of 5/32 and 0.196 inch. 93

Palmer-Shile Steel-Armored Fork-Truck Pallet

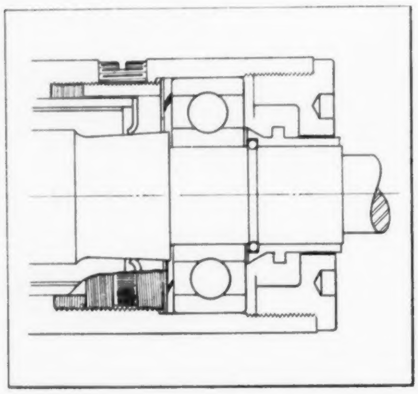
Because of the interest shown by industry in the power fork-truck, the Palmer-Shile Co., 7100 W. Jefferson Ave., Detroit, Mich., has brought out a complete line of steel and wood pallets for such trucks. They are double-faced and constructed of hardwood faces, held rigidly together with steel bindings. There are no bolts, screws, or nails, welded construction being used throughout; if it becomes necessary to replace a board, it can be done by removing a small angle at each end. 94

"Magne-Blox" Parallels and V-Blocks for Magnetic Chucks

The George Scherr Co., Inc., 128 Lafayette St., New York City, has just placed on the market a set of magnetic parallels and V-blocks for use with magnetic chucks. These blocks, designated "Magne-Blox," are made of alternate laminations of brass and special iron of high magnetic capacity. The set consists of two parallels, 1 by 1 3/4 by 3 3/4 inches, and two V-blocks, 1 3/4 by 2 3/8 by 1 7/8 inches, in a hard-wood case. These blocks are intended especially for surface grinding operations on odd- or irregular-shaped pieces that cannot be held directly on the face of the magnetic chuck in the usual manner, but must be located by V-shaped or parallel blocks. 95

To obtain additional information on equipment described on this page, see lower part of page 174.

PHOTOS COURTESY WHITE MOTOR CO.



Preload Adjustment for Ball Bearings, Developed by the Dumore Co.

Dumore Preload Adjustment for Ball Bearings

To insure long bearing life and precision performance throughout a wide range of speed, the Dumore Co., Racine, Wis., has developed a preload adjustment for ball bearings which is covered by patent No. 2188251. This adjustment compensates for expansion of the quill shaft caused by heat.

When the quill shaft expanded under the previous system of mounting, the preload spring increased the load on the bearings, placing them under excessive strain at the higher speeds. With the present arrangement, invented by James H. Nelson, the amount of preload is determined by a short stiff spring adjusted by means of an internal nut in the quill tube. With the preload spring located at the inside edge of the outer bearing raceway, the pressure due to expansion is counteracted by the spring, so that the pressure on the bearings decreases at high speeds and increases at lower speeds. The new preload spring arrangement permits the bearings to run freely, operating at high speeds with a minimum amount of wear. 96

Westinghouse "Corox" Heaters for Tempering Baths

A new "Corox" immersion heater for oil tempering baths has been brought out by the Westinghouse Electric & Mfg. Co., Mansfield, Ohio. The new unit is made of high-quality steel tubing having a low watt density of approximately 11 watts per square inch of active tube surface. The heaters are available with an effective heating depth of either 5 or 10 inches. The 5-inch units have a rating of 2000 watts, and the 10-inch units of 4000 watts, at 115 or 230 volts. They can also be connected in series on 440 volts. 97

Roe Polishing and Buffing Machine

The Lewis Roe Mfg. Co., 1050 DeKalb Ave., Brooklyn, N. Y., has developed a polishing machine for light buffing and coloring work, which consists essentially of a head

Polishing and Buffing Machine Made by the Lewis Roe Mfg. Co.

and stand with a 1/4-H.P. alternating- or direct-current driving motor mounted on the stand. This machine is equipped with two self-aligning ball bearings, and has a 3/4-inch spindle, 20 inches long. Longer spindles can be furnished if required. The spindles are turned down at the ends to a diameter of 1/2 inch and threaded with 8 square threads to the inch. The spindle is tapped for taper points furnished with the machine.

A V-belt and a device for keeping the belt at a uniform tension are furnished. The machine weighs approximately 100 pounds, and can be moved about the shop. 98

"S & H" Soft Hammers

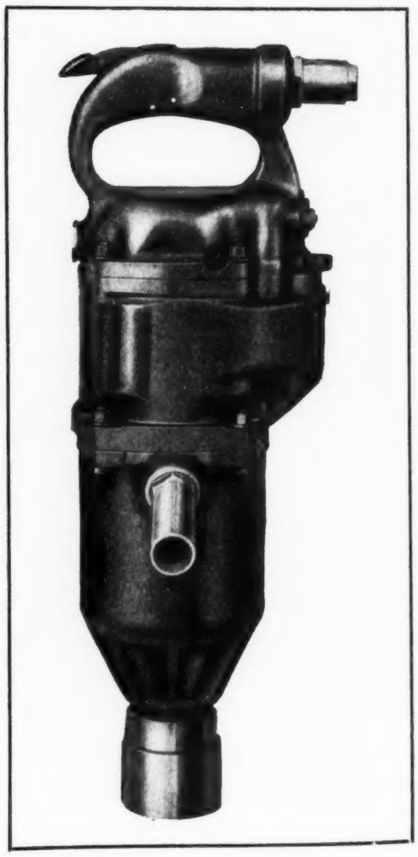
A line of soft hammers in 1-, 2 1/2-, and 5-pound sizes is being made by the Melvin F. Doty Co., 15418 Wark Ave., Detroit, Mich., for use in machine shops to protect drill jigs, special tools, fixtures, and finished parts from the abuse often caused by using hard hammers.

The grip of these hammers is made of aluminum, securely cast on a heavy wire shank. The soft metal hammers are molded about the looped end of the metal shanks. Separate handles can be furnished, as well as the complete hammers. Hinged molds for remolding battered hammers at slight expense can also be provided. 99

Reversible Pneumatic Wrenches

The Chicago Pneumatic Tool Co., 6 E. 44th St., New York City, is placing on the market two new pneumatic reversible wrenches, the Nos. 365-R and 375-R. These wrenches are particularly adapted for use in structural steel and shipbuilding work, and in railroad shops for removing and applying bolts and nuts of various types.

The No. 365-R wrench employs a slow-speed rotary motor of simple design, developed for efficient and economical operation. This wrench has no gears or resilient member in the driving unit, is light in weight, and is very easy to handle. It has a



Chicago Pneumatic Reversible Wrench

To obtain additional information on equipment described on this page, see lower part of page 174.

capacity for handling 1 1/4-inch bolts, is 16 1/4 inches long, has a spindle offset of 2 1/4 inches, and weighs 27 1/2 pounds.

The No. 375-R wrench can be used on nuts up to and including the 1 3/4-inch bolt size. It has an overall length of 21 1/4 inches, a spindle offset of 3 inches, and weighs 61 pounds. 100

Cramer Automatic Reset Timer

An automatic reset timer (Type RS) has been placed on the market by the R. W. Cramer Co., Inc., Centerbrook, Conn., for the automatic, accurate timing of a variety of electrical circuits. With this timer, the settings are easily adjusted by setting a pointer to the desired time scale. Several time ranges are available to meet various requirements. The contact has a capacity of 10 amperes at 115 volts or 5 amperes at 230 volts. The instrument can be furnished for flush-panel mounting or in a dustproof die-cast case suited for BX or conduit wiring. 101

Diamond Lap Hones for Multi-Purpose Reciprocating-Head Tools

Diamond laps in any grit required from rough-cut to 500 grit, 1/32 or 1/16 inch thick and 1 inch long on the face of the lap, are now available for use with the multi-purpose tool manufactured by the H & H Research Co., 1925 Buena Vista, Detroit, Mich. This tool, with its short reciprocating stroke, is specially adapted for taking off the last few thousandths inch of material in die-sinking, pattern, tool, and plastic mold making or for any delicate, accurate work of a similar nature. It develops a 6- to 12-pound push at the head of the tool, and is driven by a 110-volt universal motor. Filing, burring, honing, chipping, and sawing operations can also be performed with the tool. 102

* * *

Roper Pumps—Correction

In March MACHINERY, page 151, in the first paragraph of the article entitled "Roper Rotary Pumps," it was erroneously stated, due to a typographical error, that the line of rotary pumps described includes sizes with capacities ranging from 1 to 100 gallons per minute and speeds up to 1800 R.P.M. The capacities of the new line of pumps actually range from 1 to 1000 gallons per minute.

* * *

Cincinnati Hydraulic Universal Grinding Machine Correction

A description of a universal grinding machine built by Cincinnati Grinders Incorporated, Cincinnati, Ohio, was published on pages 143 and 144 of March MACHINERY. In the first column on page 144 it stated: "The table has . . . a slow movement of 0.050 inch per revolution of the handwheel for fine adjustments and shoulder grinding." This, we are informed, should have read: "The table has... a slow movement of 0.1 inch per revolution of the handwheel for fine adjustments and shoulder grinding."

The Sixteenth Decennial Census

The sixteenth decennial census being taken this year by the Bureau of the Census, Washington, D. C., is an enormous undertaking. Data will be collected relating to 3,000,000 business enterprises, including 170,000 manufacturing establishments, 14,000 coal and metal mines, and 400,000 oil and gas wells. In the Census of Housing, data pertaining to 33,000,000 homes will be collected, and in the Census of Agriculture, information pertaining to 7,000,000 farms will be gathered. In addition to an enormous field force, the Bureau of the Census will employ at Washington, for the recording of the information, 700 administrative officers and specialists with their clerical assistants, together with 7000 statisticians and clerks.

The usefulness of the data recorded in the Census of Manufactures has been well demonstrated in the past. The information pertaining to the Census of Population, however, appears to go into somewhat greater detail than would seem necessary, and it is open to question whether some of the information to be gathered will actually serve a useful purpose when recorded. It may be of considerable interest to statisticians, but that does not necessarily say that it will be of such practical value that the enormous expense involved in gathering and recording such data is warranted. Some of the information appears, however, to be collected for use by other governmental bureaus, and may in this way serve a purpose.

Both private business enterprises and governmental agencies have, especially of late years, been known to gather a great deal of information for statistical purposes of doubtful value. Figures that no one uses have been recorded, classified, and filed. It takes a great deal of judgment, both in private business and in governmental bureaus, to decide exactly what information is of practical use and permanent value.

* * *

The total investment in the railroads of the United States is approximately $26,000,000,000. The net capital stock outstanding is equal to only 27 per cent of the investment, while the net funded debt outstanding amounts to 43 per cent.

Time Study Course

The State University of Iowa, College of Engineering, Iowa City, has announced a summer course devoted to motion and time study, to be held at Iowa City, June 10 to 28. This course is intended for plant managers, foremen, industrial engineers, methods and time-study men, cost accountants, and office managers. The same course was offered last year, when it was attended by executives and engineers from twenty-five different industries in the United States and Canada. Further information can be obtained by addressing Ralph M. Barnes, professor of industrial engineering, State University of Iowa, Iowa City, Iowa.

* * *

Orders received by the General Electric Co. during the first nine weeks of 1940 amounted to $66,900,000, compared with $58,900,000 in the same period last year, an increase of 13.5 per cent. The average number of employes during 1939 was 62,797, compared with 59,917 in 1938, and the total earnings of the employes amounted to $120,000,000, compared with $101,500,000 in 1938.

To obtain additional information on equipment described on this page, see lower part of page 174.

TO MEET INDUSTRY'S *Greater* DEMANDS

Ex-Cell-O Junior Single End Precision Boring Machine, Style No. 2112A.

VALVE SPRING RETAINER WASHER

MATERIAL: SAE 6150.

OPERATION: Turn O. D. of hub, turn radius, face, bore rim flange, turn and face outer flange.

DIAMETER TURNED: 2" O. D.

MACHINE USED: Ex-Cell-O Junior Single End Precision Boring Machine.

STATIONS: Two.

PRODUCTION: Approximately 75 per hour.

DETAILS: Part is loaded onto arbor and secured by draw rod and "C" washer. Fully automatic fixture. Tripping control lever advances tool, turning the hub. Then tool is hydraulically rotated to form radius. Slide moves laterally for facing operation and fixture backs away, boring rim. During this cycle, another tool faces and turns outside of rim. Fixture returns to starting position to complete the cycle.

WHEREVER the problem of industry is boring, turning, facing . . . on a production basis . . . with improved accuracy and finish . . . the installation of Ex-Cell-O Precision Boring Machines is the one sure step to the saving of time and money.

For instance, the operation shown here is typical of hundreds of production problems solved successfully through the use of the Ex-Cell-O Junior, Single End Precision Boring Machine . . . resulting in worthwhile economies—through reduction of rejections and minimizing of inspection—in both manufacturing of the product and final assembly process.

If your problem is boring, turning, facing . . . simple or difficult . . . Ex-Cell-O has a Precision Boring Machine to meet your need exactly and economically. Send us details of your requirements, or ask for catalogs on Boring Machines.

EX-CELL-O CORPORATION • 1212 OAKMAN BLVD. • DETROIT, MICH.

EX-CELL-O *Precision* **MACHINES AND TOOLS**

NEWS OF THE INDUSTRY

California and Texas

W. L. KENNICOTT has been appointed representative in southern California for the Kennametal-tipped tools made by the McKenna Metals Co., Latrobe, Pa. Mr. Kennicott's office is at 4905 S. Santa Fe Ave., Los Angeles, Calif.

CHIKSAN TOOL CO., formerly located at Fullerton, Calif., is now established in new quarters at Brea, Calif.

E. K. ANDERSON has been appointed manager of the Dallas, Tex., branch office of Cutler-Hammer Inc., Milwaukee, Wis., located at 624 Santa Fe Bldg. This office serves the states of Arkansas, Texas, Oklahoma, and the southern part of New Mexico.

Illinois

ARMOUR INSTITUTE OF TECHNOLOGY, Chicago, Ill., has announced that the Institute will conduct a three-term summer graduate school for engineers, industrialists, and educators in engineering and science, beginning with the coming summer. It is planned to invite scientists and engineers of distinction to lecture on modern developments in engineering and science. For further information, address Dr. L. E. Grinter, vice-president and dean of the Graduate Division, Armour Institute of Technology, Chicago, Ill.

CHARLES L. JARVIS CO., Middletown, Conn., has established a branch office and stock-room at 1344 W. Washington Blvd., Chicago, Ill., with G. V. RAMSTACK in charge. The complete line of the company's products will be serviced, including tapping attachments, flexible shaft machines, flexible shafting, rotary files, etc.

JOHN WALDRON CORPORATION, New Brunswick, N. J., has appointed E. J. EHRET and J. D. KINSEY, with offices at 307 S. LaSalle St., Chicago, Ill., sales representatives in the Chicago territory for the complete line of Waldron gear type and Francke flexible couplings.

AMERICAN NICKELOID CO., Peru, Ill., has established an export office at 201 N. Wells St., Chicago, Ill., to meet the increased demand for its pre-finished metals in many foreign markets. Sales representatives are being established in all the principal countries abroad.

J. B. TEMPLETON, formerly vice-president of Templeton, Kenly & Co., Chicago, Ill., manufacturers of Simplex jacks and equipment, was elected president of the organization at the annual meeting to succeed W. B. TEMPLETON, who is now chairman of the board of directors.

CLAROSTAT MFG. CO., INC., 285 N. Sixth St., Brooklyn, N. Y., has appointed FRANK MURPHY sales engineer in the Chicago area, with headquarters at 540 N. Michigan Blvd., Chicago, Ill.

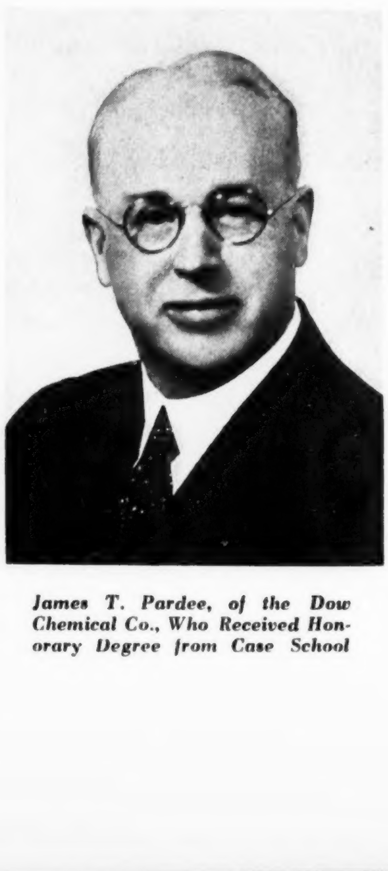
Massachusetts

ATLANTIC ABRASIVE CORPORATION, 518 Pearl St., South Braintree, Mass., has been formed to specialize in the manufacture of grinding wheels, especially for purposes where the grinding operation presents a difficult or unusual problem.

JAMES Y. SCOTT was elected president of the Van Norman Machine Tool Co., Springfield, Mass., at the meeting of the board of directors on March 5.

Michigan

JAMES T. PARDEE, chairman of the board and vice-president of the Dow Chemical Co., Midland, Mich., has been honored by the Case School of Applied Science, Cleveland, Ohio, with the degree of doctor of commercial science. Mr. Pardee was born in Cleveland, and is a graduate of the Case School, with the degree of bachelor of science in civil engineering.



James T. Pardee, of the Dow Chemical Co., Who Received Honorary Degree from Case School

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill., announce a 30,000 square foot addition to their Detroit plant, bringing the total floor area up to approximately 250,000 square feet. Over one thousand new products and sizes have been added to the wide range of steel and allied products already carried. Thirteen modern cranes speed the stock handling, and railroad sidings having a capacity for fifteen cars take care of inbound and outbound freight shipments.

GEORGE A. SMITH, assistant plant manager of the Meriden, Conn., factory of the New Departure Division of General Motors Corporation, has been appointed general manager of the Hydra-Matic Transmission Division of General Motors Corporation, Detroit, Mich. Mr. Smith became connected with New Departure in 1920 as foreman of machining inspection, and advanced rapidly through various positions until his appointment as assistant plant manager last year.

DOW CHEMICAL CO., Midland, Mich., has purchased 800 acres of land on the Gulf Coast at Freeport, Tex. The company plans a large industrial development on this site devoted mainly to the utilization of sea water as a source for magnesium. When completed, this development will involve an expenditure of approximately $5,000,000. Many contracts have been let for equipment, buildings, laboratories, etc.

DOW CHEMICAL CO., Midland, Mich., recently made 175 service awards to its long-time employes. Five of these employes have been with the company fifty years or more; 11 thirty-five years or more; 10, thirty years or more; 42, twenty-five years or more; and 107, twenty years or more. Those who have been in the company's employ thirty-five years or more received gold watches.

APPROVED MFG. CO. is now located at 650 E. Troy St., Ferndale, Mich., from which plant the company is in a position to supply a complete line of screw machine products to the production industries.

CONGRESS DIE CASTING DIVISION, CONGRESS TOOL & DIE CO., has opened a new plant at 3750 E. Outer Drive and Mt. Elliott, Detroit, Mich., for the manufacture of Congress drives and die-castings.

New Jersey

BENEDICT-MILLER, INC., 216-218 Clifford St., Newark, N. J., has been incorporated as a steel distributor. PURDY F. BENEDICT is president of the new concern. Mr. Benedict has been vice-president and director of sales of the Faitoute Iron & Steel Co., Newark, N. J., for the last twenty-two years. HARVEY L. MILLER is treasurer of the company. He has also been identified with the Faitoute or-

ganization for many years. Benedict-Miller, Inc., has been appointed exclusive agent in northern New Jersey for the Vanadium Alloys Steel Co. and its affiliates, the Colonial Steel Co. and the Anchor Drawn Steel Co. It also has the agency for Vascoloy-Ramet, the tantalum-carbide tool and die material.

Foster Steel Treating Co. has been organized at 220-222 Clifford St., Newark, N. J., to engage in commercial heat-treating. Harold M. Foster is president of the concern. Mr. Foster's experience with the steel industry began in 1917 with the Midvale Steel Co. For the last ten years he has been manager of tool and alloy steel sales for the Faitoute Iron & Steel Co., of Newark.

Elastic Stop Nut Corporation, 1015 Newark Ave., Elizabeth, N. J., has recently broken ground for a new plant at Vauxhall Road, Union, N. J., a suburb of Newark. The plant will be used solely for the manufacture of the corporation's line of self-locking nuts. The transfer from the present plant will be made about June 1.

New York

General Electric Co., Schenectady, N. Y., is presenting an exhibition of electrical progress and a special showing of the General Electric House of Magic in a number of industrial centers. The cities in which this exhibit will be shown include Hartford, Conn.; Buffalo, N. Y.; Cleveland and Cincinnati, Ohio; Detroit, Mich.; Chicago, Ill.; Baltimore, Md.; Pittsburgh, Pa.; and Newark, N. J. Some of these exhibits have already been held, while others will take place in the next two months. Detailed information can be obtained from K. G. Patrick, General Electric Co., 570 Lexington Ave., New York City.

Robert Fallon, a toolmaker in the Turbine Department of the General Electric Co., Schenectady, N. Y., recently received one of the Charles A. Coffin Foundation Awards, made annually by the General Electric Co. to employes for distinctive accomplishments. Only twenty-two men received these awards in 1939. Mr. Fallon received the award for producing lead-screws from 9 to 13 feet in length having unusual precision.

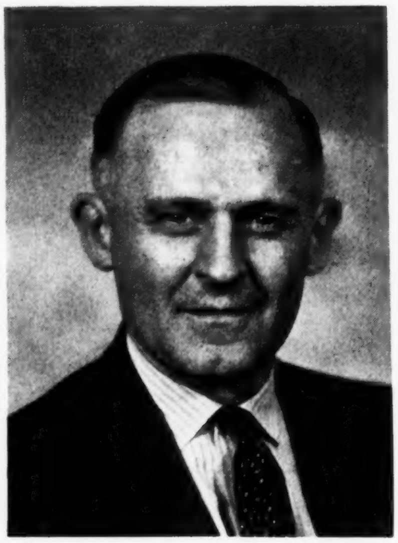
F. G. Flocke, of the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York, gave a talk on "Fabrication of Monel, Nickel, and Inconel, in Solid and Clad-Plate Construction," before the Oklahoma City Section of the American Welding Society at the Biltmore Hotel in Oklahoma City on March 1, and before the Wichita Section of the same society in Wichita, Kans., on March 5.

Champion Rivet Co., Harvard Ave. and E. 108th St., Cleveland, Ohio, has just concluded arrangements with the United States Steel Export Co., 30 Church St., New York City, to handle the exclusive sale of Champion welding electrodes for export throughout the world.

J. M. Stoddard has been made plant superintendent of the Westcott Chuck Co., Oneida, N. Y. Mr. Stoddard was formerly plant superintendent of several concerns in Syracuse, N. Y.

Ohio

P. A. Abe, works manager of the Monarch Machine Tool Co., Sidney, Ohio, was elected vice-president in charge of engineering and production at a recent meeting of the board of directors. J. A. Raterman, purchasing agent, was elected vice-president in charge of purchasing and plant engineering. Mr. Abe started with the company as a lathe operator in 1915. During his twenty-five years association with the company he has advanced through the ranks of toolmaker, tool-room foreman, general foreman, superintendent, and works manager. Mr. Raterman was employed by the company as a machinist in 1917. Since then he has been salesman, superintendent in charge of assembly, head of the production control department, and purchasing agent. Both Mr. Abe and Mr. Raterman have been directors for the last three years.



P. A. Abe, Vice-president in Charge of Engineering and Production, Monarch Machine Tool Co.

J. A. Raterman, Vice-president in Charge of Monarch Purchasing and Plant Engineering

William H. Richardson has been appointed assistant general sales manager of the Timken Roller Bearing Co., Canton, Ohio. This is a new position created because of the increase in the company's activities in bearings for general industrial use. Mr. Richardson has been associated with the company for twenty-three years. He was previously general manager of the Service Sales Division of the company, in which position he will be succeeded by E. H. Austin, who has been connected with the company for twenty-one years. R. P. Proffitt has been appointed Chicago Division manager of the company. Jay Irwin has been made Chicago district manager of the company's Steel and Tube Division. Mr. Irwin joined the metallurgical department of the company in 1937, and later became a salesman in the Chicago branch office. Robert S. Crawford has been appointed superintendent of rolls. He was previously roll designer and engineer for the Republic Steel Co., Cleveland, Ohio.

Pennsylvania

George L. Gordon, formerly in charge of the New York office of the Lukens Steel Co., has been transferred to the company's main office at Coatesville, Pa., where he will engage in special sales work. J. J. Reynolds, who has been sales representative in the New York office for the last thirteen years, has been appointed manager of sales at New York.

William R. Bauer, Park Bldg., Pittsburgh, Pa., has been appointed representative for the Hill Clutch Machine & Foundry Co., Cleveland, Ohio, manufacturer of power transmission machinery.

John A. Maywhort has been made president of the Bilgram Gear & Machine Works, Philadelphia, Pa., to fill the vacancy created by the death of Max Uhlmann.

Harold S. Falk, New President of the Falk Corporation

Wisconsin

Herman W. Falk, founder of the Falk Corporation, Milwaukee, Wis., manufacturer of gears, couplings, marine drives, steel castings, etc., and president since the inception of the company, has become chairman of the board and is succeeded as president by Harold S. Falk. The company also announces the election of E. P. Connell as treasurer, and M. A. Carpenter as secretary. Harold Falk, the new president, first started working for the company in 1900 during his summer vacation. Upon graduating from the general engineering course at the University of Wisconsin in 1906, he became permanently employed with the concern as assistant to the superintendent. In 1920 he was appointed vice-president and works manager, which positions he held until he became president. He is widely known for the part he has played in the apprenticeship movement throughout the country.

Square D Co., manufacturer of electric switches and controls, has awarded contracts to the Austin Co. for the design and construction of a new plant and office building, 238 by 430 feet, on North Richards St., Milwaukee, Wis. The building will be of monitor construction, with welded steel trusses, and will have two 60-foot and three 40-foot aisles. The offices will occupy a space of 50 by 238 feet.

* * *

The orders of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in 1939 were 43 per cent greater than in 1938, totalling $214,239,000. The unfilled orders at the end of 1939 were over $70,000,000, compared with $40,000,000 at the end of 1938. Only 1929 and 1937 showed a greater volume of business.

COMING EVENTS

April 9-10 — Midwest Power Conference at the Palmer House, Chicago, Ill., sponsored by the Armour Institute of Technology in cooperation with seven middle-western colleges and universities and various engineering societies.

April 10-12—Fortieth convention of the International Acetylene Association at the Schroeder Hotel, Milwaukee, Wis. For further information, address the International Acetylene Association, 30 E. 42nd St., New York City.

April 11-12—Spring meeting of the Galvanizers Committee at the William Penn Hotel, Pittsburgh, Pa. For further information, address the American Zinc Institute, Inc., 60 E. 42nd St., New York City.

April 12-13—Regional Conference of the American Foundrymen's Association at Michigan State College, East Lansing, Mich. For further information, address Glenn Coley, 2000 Second Ave., Detroit, Mich.

April 12-13—Meeting of the Petroleum Division of the American Society of Mechanical Engineers at Norman, Okla., following the Petroleum Fluid Metering Conference to be held at the University of Oklahoma, April 11 and 12. For further information, address William J. Overton, 211 Midco Bldg., Tulsa, Okla.

April 16-18—Eleventh annual Safety Convention of the Greater New York Safety Council at the Hotel Pennsylvania, New York City. For further information, address Greater New York Safety Council, 60 E. 42nd St., New York City.

May 1-3—National spring meeting of the American Society of Mechanical Engineers at the Hotel Bancroft, Worcester, Mass. Clarence E. Davies, secretary, 29 W. 39th St., New York City.

May 6-8—Machine Tool Electrification Forum, to be held under the sponsorship of the Westinghouse Electric & Mfg. Co. at the company's plant at East Pittsburgh, Pa. For further information, address Hendley N. Blackmon, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

May 6-10—Convention and exhibition of the American Foundrymen's Association to be held in Chicago, Ill., with exhibits at the International Amphitheater, and headquarters of the convention at the Palmer House. American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

May 7-8—National Production meeting of the Society of Automotive Engineers at the Bond Hotel, Hartford, Conn. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

May 13-14—Spring meeting of the Associated Machine Tool Dealers of America at the Claridge Hotel in Atlantic City, N. J. Thomas A. Fernley, Jr., executive secretary, 505 Arch St., Philadelphia, Pa.

May 19-23—Forty-fifth annual Credit Congress of the National Association of Credit Men at the Royal York Hotel, Toronto, Canada. R. H. Ryan, chairman, National Committee, Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn.

May 20-22—Annual convention of the American Gear Manufacturers' Association at Grove Park Inn, Asheville, N. C. J. C. McQuiston, manager-secretary, 602 Shields Bldg., Wilkinsburg, Pa.

May 21-22—Forty-second annual convention of the National Metal Trades Association at the Hotel Biltmore, New York City. Harry S. Flynn, secretary, 122 S. Michigan Ave., Chicago, Ill.

June 9-14 — Summer meeting of the Society of Automotive Engineers at the Greenbrier Hotel, White Sulphur Springs, W. Va. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

June 17-20—Semi-annual meeting of the American Society of Mechanical Engineers at the Hotel Pfister, Milwaukee, Wis. Clarence E. Davies, secretary, 29 W. 39th St., New York City.

June 24-28—Annual meeting of the American Society for Testing Materials at Atlantic City, N. J. C. L. Warwick, secretary-treasurer, 260 S. Broad St., Philadelphia, Pa.

October 7-11—National Safety Congress and Exposition to be held at the Stevens Hotel, Chicago, Ill., under the auspices of the National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

October 8-12—Southern Power and Engineering Show in the Armory Auditorium, Charlotte, N. C. For further information, address Junius M. Smith, vice-president, Southern Power and Engineering Show, Inc., P. O. Box 1225, Charlotte, N. C.

October 21-25—National Metal Exposition, to be held at Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, 7301 Euclid Ave., Cleveland, Ohio.

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OBITUARIES

Otto Lundell

Otto Lundell, who until his retirement a year ago from active business was president of the Michigan Tool Co., the Colonial Broach Co., and the Detroit Tap and Tool Co., died at Fort Lauderdale, Fla., February 22, at the age of sixty years.

Born in Sweden November 8, 1879, Mr. Lundell received his technical education at the Chalmers Institute in Gothenburg. Immediately upon finishing his education, in 1908, he came to America. He was first employed with a Rockford, Ill., machinery manufacturer as a machinist, and stayed with that concern for six years, during a part of which time he was a department superintendent.

Otto Lundell

The Michigan Tool Co. was organized in 1915 by Mr. Lundell and his associates, Mr. Lundell serving as vice-president of the concern until 1935, when he became president. In 1918, he organized the Colonial Broach Co., and was president of that company until his retirement. The Detroit Tap and Tool Co. was another manufacturing company organized by Mr. Lundell. Notable in Mr. Lundell's career was the development of the now widely adopted Michigan Tool method of finishing gears for automotive transmissions.

Mr. Lundell served as director of the Peoples State Bank of Hamtramck. He was also active in the Swedish Engineering Society and the American Society for Steel Treating.

He is survived by his wife, a son—now identified with the Colonial Broach Co.—and three daughters.

R. E. Clingan

R. E. Clingan, Chicago district sales manager of the Jones & Lamson Machine Co., Springfield, Vt., died on March 11 at St. Petersburg, Fla., at the age of sixty years.

Mr. Clingan was born in New Haven, Conn., where he received his education and early training in machine shop practice. When nineteen years old, he became employed with the F. B. Shuster Co., of New Haven, where he worked for a number of years in the manufacturing and engineering departments. He went with the Hess-Bright Co. (now the S K F Industries, Inc.) in Philadelphia in 1908, and remained with that company until 1919, when he became associated with the Bock Bearing Co., Toledo, Ohio, as vice-president and general manager. The following year he was made president, and remained in that capacity until the company was sold to the Timken Roller Bearing Co. in 1927, at which time he joined that company in Canton, Ohio, in an executive capacity.

In 1928, he became associated with the New Departure Mfg. Co., Bristol, Conn., in charge of industrial sales. In 1934, he resigned, due to illness, and after a six months' rest, joined the Jones & Lamson Machine Co. as Chicago district sales manager. He made his home in Chicago until his death. He was a member of the Society of Automotive Engineers and of the Army Ordnance Association.

Notwithstanding Mr. Clingan's busy career, he was always an active worker in community and social affairs. His passing will be felt not only by the Jones & Lamson Machine Co., but by his many friends throughout the country.

Paul C. Sauerbrey

Paul C. Sauerbrey, vice-president and general manager of the Plymouth Division of the Chrysler Corporation and president of the Chrysler Corporation of California, died at Fort Lauderdale, Fla., March 3, at the age of fifty-nine years. He was in Florida on a vacation when he died. Mr. Sauerbrey was born in New York and educated in the public schools and at Cooper Union. He first worked for the Mergenthaler Linotype Co. in Brooklyn, and later became a pressman on New York newspapers. In 1906, he went with the Palmer-Singer Auto Co., and in 1911 he went to Flint, Mich., to enter the employ of the Mason Motor Cars Co., manufacturer of one of the first Chevrolet engines. He later became superintendent of the Sterling Motor Co. and of the Timken Axle Co., both in Detroit, after which he was manager of the Motor Products Plant, a division of the Chevrolet Motor Co., at Muncie, Ind.

In 1926, he joined the Chrysler Corporation, where his duties included the organization of the Plymouth Division, of which he became vice-president in charge of manufacturing in 1929.

Charles Arthur White, secretary-treasurer of the Leeds & Northrup Co., Philadelphia, Pa., died on March 2 at the Germantown Hospital in Philadelphia after a two weeks' illness, at the age of fifty-eight years. Mr. White was born near Poughkeepsie, N. Y. From 1902 to 1914 he was associated with Adriance Platt & Co., manufacturers of farm machinery, and from 1915 to 1920 was cost accountant, and later purchasing agent, of the Hero Mfg. Co. He joined the Leeds & Northrup Co. as chief accountant in 1920, and in 1928 was made secretary-treasurer.

Hutton H. Haley, Detroit district sales representative of the American Foundry Equipment Co., Mishawaka, Ind., died on March 1 at the age of fifty-three. Mr. Haley started his business life as a broker of foundry supplies in Kansas City. In 1911, he joined the Sand Mixing Machine Co., which later became the American Foundry Equipment Co., and was continuously associated with that company until his death.

M. Stewart Dravo, manager of the Pittsburgh branch office of the Crucible Steel Co. of America, died on February 20 at the age of fifty-six. Mr. Dravo had been long associated with the company, having joined the organization in 1909 upon graduating from Trinity College in Hartford, Conn.

DeWitt Page, president and general manager of New Departure Division of General Motors Corporation, Bristol, Conn., and a director and vice-president of General Motors Corporation, died suddenly at Hialeah Park, Fla., on February 28, aged seventy years.

* * *

Industrial Gas Conference

The Industrial Gas Section of the American Gas Association, 420 Lexington Ave., New York City, held a conference at the Commodore Perry Hotel, Toledo, Ohio, March 28 and 29, at which time a great many subjects pertaining to the uses of industrial gas were discussed and a number of important papers were read at the four sessions held. Among the papers read should be mentioned one on "New Developments in Open-Flame Heating and Their Importance to the Gas Industry," by A. M. Thurston, of the East Ohio Gas Co., Cleveland, Ohio. One of the sessions was devoted to discussions of various subjects, among which were "Metal Treating and Melting," and "Process and Comfort Air Conditioning."

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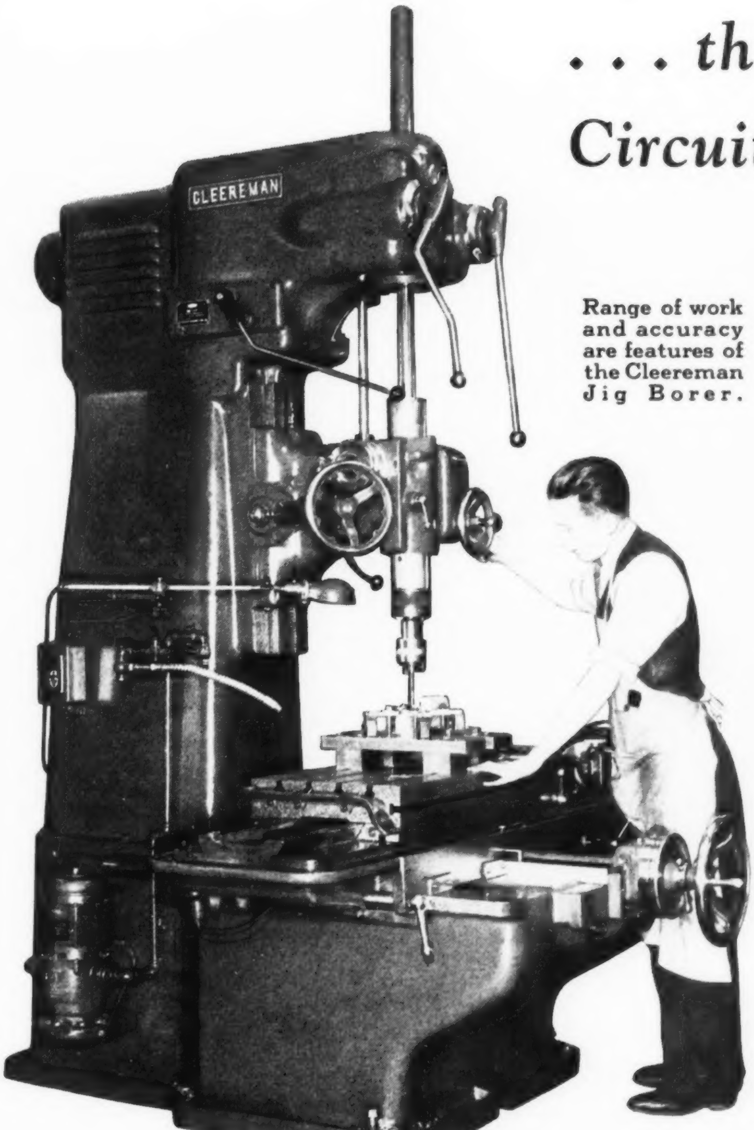

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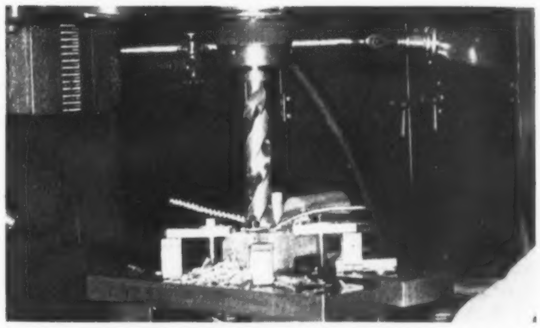
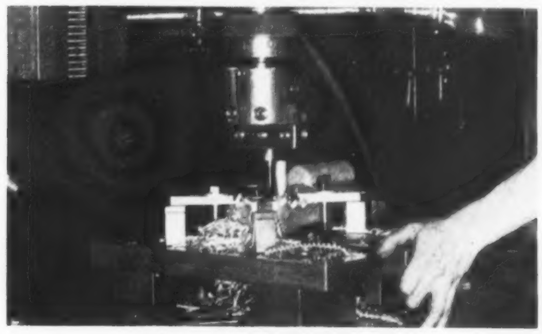


Cleereman Jig Borer drilling large pivot hole in circuit breaker crank arm.



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NEW BOOKS AND PUBLICATIONS

A PRIMER OF TIME STUDY. By F. W. Shumard, Industrial Engineer. 519 pages, 6 by 9 inches; 55 charts and illustrations. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. Price, $5.

This book has been prepared for those who are interested in time study as applied to industrial operations, and is based on the use of the stop-watch as a means of establishing standard time for the various machine and manual labor elements met with in such operations. The book assumes that time-study practice is a new subject to the reader, and approaches the subject, therefore, in an elementary manner, proceeding gradually to more advanced principles.

The text is divided into twenty-four chapters, which may be considered as separate lessons to be mastered by the reader. No attempt is made to influence the reader in favor of any particular system or wage-payment plan. Piecework, premium, and group plans are all impartially treated. The book covers not only the fundamentals, but the advanced stages of time-study work in such a manner that the reader should be able to handle any wage-payment incentive plan.

IMPACT CLEANING. By William A. Rosenberger. 466 pages, 6 by 9 inches. Published by the Penton Publishing Co., Cleveland, Ohio. Price, $7, postpaid.

This book is written essentially for the buyer and user of sand-blast equipment, not as a handbook. The facts presented have been established by tests and experience. The text is divided into three parts, the first dealing with nozzle blast cleaning equipment; the second with mechanical impact cleaning; and the third with ventilation of impact cleaning equipment. The material includes information on compressed-air blast equipment and direct-pressure equipment, abrasives, types of wheels, testing of wheels, power requirements of centrifugal wheels, special equipment, and a fund of other data relating to the most important phases of the impact cleaning process.

TRAINING PROCEDURE. By Frank Cushman. 230 pages, 5 by 7 1/2 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $2.

In this book the author, who is widely known for his work with the Federal Vocational Office in Washington, discusses the problems encountered in planning, organizing, operating, and maintaining efficient training programs in industrial, business, and public service organizations. The scope of the discussion is limited to problems of training employed personnel, with the object of improving the performance of the work.

* * *

Details of Lincoln $200,000 Award Program

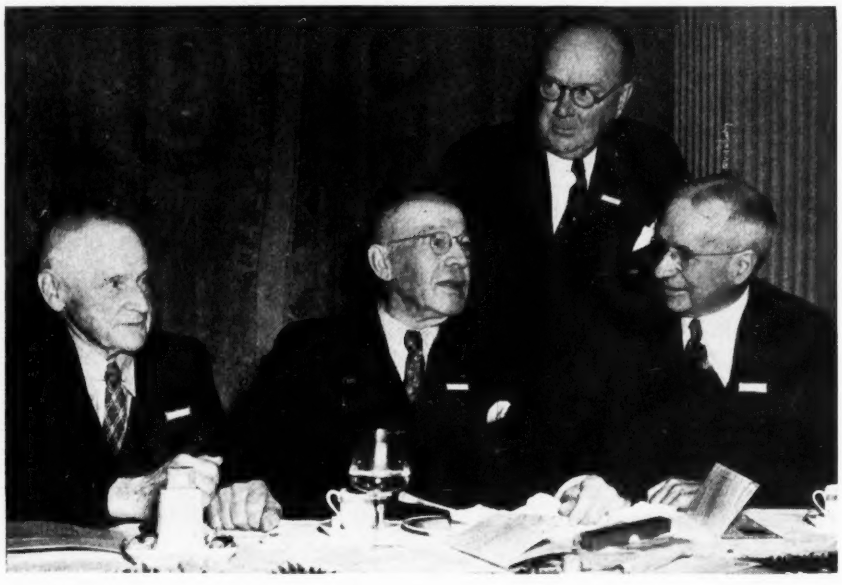
A forty-eight page book entitled "$200-000 Industrial Progress Award Program" has been published by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. This book gives complete information relating to the 458 awards which will be made for studies and contributions of information under the Award Program. The book indicates the wide scope of the competition, outlines the subject matter of the studies to be made, indicates who is eligible for participation (indicating that practically anyone may participate), describes the methods for judging papers, and gives many suggestions of practical assistance to those who plan to compete for awards. An important point is stressed with regard to the method of presentation: "Style of presentation, such as expensive or elaborate bindings, etc., will have no bearing on the rating of papers."

Approximately half the book is devoted to listings and illustrations of typical subjects for papers in the twelve classifications and forty-six sub-divisions of the Progress Program. A copy of the book can be obtained free by everyone interested in participating in the competition, and by executives and others who desire to encourage participation on the part of their employes or associates. Requests for copies should be addressed to the secretary of the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

* * *

Brown & Sharpe Graduate Apprentice Banquet

Saturday evening, March 2, the Brown & Sharpe Apprentice Graduates held their second banquet at the Providence-Biltmore Hotel, with an attendance of 425 former apprentices of the Brown & Sharpe Mfg. Co., Providence, R. I. A large number of those attending came from far away cities in the United States and Canada. Hundreds of former Brown & Sharpe apprentices now hold important positions in industry all over the country, as well as abroad. A book listing the names of Brown & Sharpe apprentice graduates will be sent by the company to anyone interested.



Four former Brown & Sharpe apprentices present at the graduate apprentice reunion: Seated (left to right) are Frank H. Lord, of Providence, R. I., who started his apprenticeship sixty-one years ago; Charles R. Northup, manager of the Syracuse office of the Brown & Sharpe Mfg. Co., a graduate of 1884; and Henry Buker, vice-president and general sales manager of Brown & Sharpe, who finished his apprenticeship forty-eight years ago. Standing is Clayton R. Burt, president and general manager, Pratt & Whitney Division Niles-Bement-Pond Co., Hartford, Conn., who also finished his apprenticeship forty-eight years ago. (Photograph Courtesy Providence Journal)